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WORK PLAN
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL AREA B
NAVAL BASE
NORFOLK, VIRGINIA

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Atlantic Division Naval Station
Norfolk, Virginia

Prepared by:

OHM Remediation Services Corp.
Pittsburgh, Pennsylvania
A Subsidiary of OHM Corporation

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SECTION
1.0

1.0 INTRODUCTION

OHM Remediation Services Corp. (OHM) is pleased to submit this work plan to the Department of the Navy (Navy) in response to the Delivery Order entitled, Soil and Debris Removal Action, Camp Allen Landfill, Area B, Norfolk Naval Station, located in Norfolk, Virginia. The Delivery Order will be executed per the requirements stated in the Final Statement of Work (SOW) for Service Delivery Order per Contract No. N62470-93-D-3032, Delivery Order No. 0003, in cooperation with the Navy. This Delivery Order will also be executed in accordance with Naval Facilities Command (NAVFAC) Specification No. 05-93-3124 dated September 27, 1993. The Contractor Quality Control Plan (CQCP), Contractor Sampling and Analysis Plan (CSAP), and Contractor Health and Safety Plan (HASP) are being provided as separate documents, but are to be implemented in conjunction with this Work Plan.

1.1 PROJECT BACKGROUND

The eastern portion of the Camp Allen Landfill (Area B) received wastes from a 1971 salvage yard fire. The Camp Allen Salvage Yard, which is still in operation, is located between Camp Allen Landfill Areas A and B. The salvage yard fire occurred in the northern portion of the yard. The salvage yard housed lubricating oil, organic solvents, paints, paint thinners, acids, caustics, and pesticides. The residue and debris resulting from this fire were buried in the eastern portion of the landfill (Area B). The site location plan is presented as Figure 1.

Based on previous studies and investigations, it has been confirmed that soils, sediment, surface water, and ground water located in the vicinity of Area B have been impacted by past disposal practices. The primary contaminants are volatile organic compounds, with some areas exhibiting low levels of semivolatile organic compounds, pesticide/PCB compounds, and metals. As the findings related to Area B are very complex, a simplified listing of primary areas of detected contamination is presented below:

- Subsurface Soil - Central portion of Area B
  - VOCs - Trichloroethene, toluene, ethylbenzene, xylenes
  - Pesticides/PCBs - 4,4'-DDE, 4,4'-DDD, Aroclor-1254
- Surface Soil - Nominal findings
- Sediment - Pond north of Area B
  - Metals - Mercury, zinc, cadmium, lead
  - VOCs - Trichloroethene, 1,2-dichloroethene, vinyl chloride

- Surface Water
  - VOCs - Trichloroethene, 1,2-dichloroethene, vinyl chloride, benzene - in pond north of Area B
  - Metals - Arsenic, cadmium, chromium, lead, mercury, zinc - in pond north of Area B and in all drainage ditches
- Shallow Ground Water
  - VOCs - Trichloroethene, 1,2-dichloroethene, vinyl chloride, benzene - south/southeast of Area B
  - Metals - Arsenic, barium, cadmium, chromium, lead, zinc - both north and south of Area B
- Deep Ground Water
  - VOCs - Trichloroethene, 1,2-dichloroethene, vinyl chloride - central Area B
  - Metals - Arsenic, cadmium, chromium, lead, zinc - north of Area B.

For this delivery order, cleanup of contaminated soils and shallow ground water will be addressed. For cleanup purposes, the nature of the contaminants in soils will be based on four constituents in accordance with the SOW. They are: vinyl chloride, 1,2-dichloroethene, trichloroethylene, and PCBs. Shallow ground water will be treated only to the extent required for removal of contaminated soils and debris; that is, shallow ground water will be extracted and treated on site in order that contaminated soil areas may be remediated and the amount of saturated waste is minimized. For cleanup purposes, the nature of the contaminants in shallow ground water will be based on the parameters for the discharge criteria per the SOW. These parameters include: benzene, toluene, ethylbenzene, xylene, acetone, arsenic, barium, lead, chromium, cadmium, zinc, and the toxic organics per 40 CFR Part 433.11.

The contaminated debris (i.e., construction rubble and other metal) will also be addressed for this delivery order. The debris will be analyzed for hazardous classification for subsequent disposal.

Seven areas have been identified per the SOW which require remediation. These areas have been numbered 1 through 7 by OHM as per Drawing RA-1 (see Appendix A). Area 1 contains construction rubble, including concrete demolition debris (Engineering Evaluation Cost Analysis, Baker Environmental, Inc., August 1993). Areas 2 through 7 have been identified as have both contaminated soil and debris.

1.2 OBJECTIVES

The objectives to be met for the removal action include:

- Pre-removal sampling and analysis for disposal pre-approval
- Obtain disposal facility approval
- Remove contaminated soil and debris to the required clean up levels
- Decontaminate the uncovered debris and stage for disposal
- Transport the soil and debris to appropriate off-site disposal facilities
- Bulk existing drums - Treat water, dispose of solids
- Perform confirmation sampling and analysis to ensure cleanup levels are achieved
- Provide an effective dewatering method and conduct general site activities (particularly materials handling) in an efficient manner to reduce the amount of liquid waste generated
- Perform on-site treatment for the ground water removed from the excavation to achieve the required discharge criteria
- Perform all work in accordance with applicable federal, state, and local regulations.

The following sections of the Work Plan describe the activities intended to meet these objectives in a safe and effective manner. In conjunction with the following sections, the work will be performed in accordance with the Contractor's Sampling and Analysis Plan (CSAP), the Contractor's Quality Control Plan (CQCP), and the Contractor's Health and Safety Plan (HASP) which are being provided as separate documents.

1.3 APPLICABLE, RELEVANT AND/OR APPROPRIATE REQUIREMENTS

Applicable, relevant and/or appropriate requirements (ARARs) are generally divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are particular to individual contaminants. Location-specific ARARs depend upon the location of the contamination and potential restrictions on activities conducted in these areas (i.e., wetlands, floodplains, etc.). Action-specific ARARs, as the name implies, govern the remedial actions. Action-specific ARARs are usually technology- or activity-based directions or limitations that control action taken at CERCLA sites.

The ARARs which must be attained or considered as part of the removal action scope at Area B are presented in the following paragraphs. Included are the recommended cleanup goals for contaminated soils.

1.3.1 Chemical-Specific ARARs

- Site-Specific Cleanup Goals for Soil - The risk-based cleanup levels provided below have been developed to assure removal of all contaminated soil to levels which are protective of the nonpotable ground water at the site. The chemicals of concern for the shallow ground water at the site are trichloroethene, 1,2-dichloroethene, and vinyl chloride. Confirmation samples taken after excavation of contaminated soil and debris must be lower than these levels for the removal to be considered complete.

Chemical of Concern	Cleanup Goal (mg/kg)
1,2-Dichloroethene	70
Vinyl Chloride	0.9
Trichloroethene	47

In addition, PCBs will be included in the confirmatory analysis. The cleanup goal for PCBs is 10 mg/kg.

- Virginia Hazardous Waste Management Regulations (VR 672-10-1) - The criteria for identifying the characteristics of hazardous waste and for listed hazardous wastes are provided in Part III of these regulations. Any wastes found to be RCRA hazardous wastes will be stored, treated, and/or disposed according to the applicable regulations in these sections.

- Clean Water Act "Indirect Discharge Requirements" (40 CFR 403); the Commonwealth of Virginia Permit Regulations (VR-680-14-01, Section 7); and local HRSD Industrial Wastewater Discharge Regulations (Part III and Appendix D). The water treatment system effluent will be discharged to the sanitary sewer system of the Hampton Roads Sanitation District (HRSD). The effluent limits will comply with the requirements tentatively set by HRSD at:

Contaminant	Discharge Limit (mg/l)
BTEX	1.0
Arsenic	0.1
Barium	2.0
Lead	1.0
Chromium	2.0
Cadmium	0.1

Contaminant	Discharge Limit (mg/l)
Zinc	2.0
Acetone	1.0
Total Toxic Organics	2.13[1]

[1]With no single organic exceeding 1.0 mg/l per 40 CFR 433.11(e).

- National Ambient Air Quality Standards - The Clean Air Act gives the criteria and requirements for ambient air quality monitoring and the requirements for reporting ambient air data and information. Based on these regulations, air at and around the Camp Allen Landfill site will be monitored to ensure compliance with these standards. The Virginia Department of Environmental Quality implements the National Ambient Air Quality Standards through the Virginia Air Pollution Control Regulations.

1.3.2 Location-Specific ARARs

- Fish and Wildlife Coordination Act (16 USC 661, et. seq.) - The Fish and Wildlife Coordination Act requires action to protect fish and wildlife from actions modifying streams or areas affecting streams. At this time, there are no plans to disturb or modify any streams in the area.

- Endangered Species Act (16 USC 153) - The Endangered Species Act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modifications to their habitat. The USDI has been contacted and it has been determined that the Peregrine Falcon, a federally endangered species, has been observed regularly at the site. The appropriate state agencies will be contacted by the Virginia Department of Environmental Quality to determine if there are any other threatened or endangered species in the area and how this act will affect the remedial activity.

- Coastal Zone Management Act - The Coastal Zone Management Act requires activities affecting land or water uses in a coastal zone to certify noninterference with coastal zone management. It has been determined that the site lies within the Virginia coastal zone. The Virginia Coastal Zone Management Office will be contacted by the Virginia Department of Environmental Quality to determine what, if any, effect the remedial activities will have on the Virginia coastal zone, and what actions will have to be taken to be in compliance with this act.

- National Historic Preservation Act - It is believed that there are no buildings listed on the National Register of Historic Places at the Camp Allen Landfill site. The Virginia Office of Historic Places has been contacted to obtain a list of historic places to determine and identify any historic landmarks/places in the general area of the site.

1.3.3 Action-Specific ARARs

- RCRA Land Disposal Restrictions (4 CFR 268) - 40 CFR Part 268 identifies those RCRA hazardous wastes that are restricted from land disposal. Waste that is land disposal restricted would be shipped off site for disposal with the proper labels, manifests, and notification forms indicating that the waste is land disposal restricted.

- OSHA (29 CFR 1910, 1926 1940) - These regulations provide occupational safety and health requirements applicable to workers engaged in on-site field activities. It is required that the regulations be followed for site workers during construction and operation of remedial activities. Therefore, all workers will be made aware of the regulations and they will be enforced by the site health and safety officer during all remedial activities.

- DOT Rules for Hazardous Materials Transport (49 CFR 107, 171.1 - 172.558) - The wastes from the remedial activities will be classified for transportation based on the chemicals present in the material. Shipping papers (including hazardous waste manifests) will be prepared that describe the hazardous material offered for transportation and will include contents, shipper's name, proper shipping name, hazard class, identification number, total quantity, and certification that the material is presented according to DOT regulations. All wastes will be packaged according to DOT regulations with the proper markings on each container.

- Virginia Solid Waste Regulations (VR-672-20-10) - The purpose of these regulations is to establish standards and procedures pertaining to the construction, operation, maintenance, closure, and post-closure of solid waste management facilities in the Commonwealth of Virginia in order to protect the public health, public safety, the environment, and natural resources. All Virginia Solid Waste Regulations will be strictly adhered to during disposal of uncontaminated rubble from the Camp Allen Landfill site, and all applicable permits will be obtained.

- Virginia Hazardous Waste Management Regulations (VR 672-10-1) - Because Virginia administers an authorized state RCRA program, the Virginia Hazardous Waste Management Regulations (VHWMR) may serve as the governing ARAR in place of the RCRA regulations contained in the 40 CFR Parts, except for the Land Disposal Restrictions of 40 CFR Part 268. Transportation of contaminated soil and debris will be conducted in accordance with VHWMR Part V (Manifest Regulations for Hazardous Waste Management) and Part VII (Regulations Applicable to Transporters of Hazardous Waste), and VHWMR (VR 672-30-1) Regulations Governing the Transportation of Hazardous Materials.

- OHM will submit the E&C Plans to LANTDIV for approval.

SECTION
2.0

2.0 ORGANIZATION OF PROJECT

2.1 ANTICIPATED QUANTITIES OF MATERIALS

OHM has reviewed the proposed removal action SOW and has determined that the following activities will be performed:

- Perform the site preparation activities.
- Perform pre-removal action sampling (test pits) and analysis to obtain waste disposal facility approval.
- Install a dewatering system capable of removing approximately 75 gpm.
- Install a water treatment system capable of providing metals and organics removal to the discharge criteria. The system will have a through put capacity of 75 gpm with sufficient storage capacity to be able to operate on a batch operation if necessary. Anticipated daily maximum quantity of water is 108,000 gpd.
- Remove approximately 4,600 cubic yards of soil and debris from the designated excavation areas, screen the material to remove the debris, clean the debris and dispose as nonhazardous material, and dispose of contaminated soil at a RCRA landfill.
- Provide transportation and disposal of all waste materials.
- Remove investigative-derived waste from drums and dispose of properly. The drums of water will be treated in the on-site water treatment facility; the nonhazardous soil will be blended with the excavated soil and disposed off site; and the hazardous drums, estimated at less than 20, will be disposed as drums.
- Place and compact approximately 4,600 cubic yards of backfill material in the excavations.
- Regrade and vegetate the disturbed areas as specified. Restore approximately 1,000 square yards of wetlands.
- Remove the dewatering system and decontaminate site equipment, treat water through water treatment facility, and remove water treatment facility.

- Perform site cleanup and vegetate all disturbed areas. Demobilize resources.

- Prepare final report.

2.2 MANPOWER REQUIREMENTS

The work requires that various crews be on site at the same time to perform all of the removal action activities. OHM estimates separate crews will be required for the proposed activities. Table 2-1 provides the listing of activities, the number of crews required for that activity, and the manpower and equipment of that crew. Crew sizes and types will be defined in a separate submittal.

2.3 MANAGERIAL APPROACH TO CONSTRUCTION

OHM's approach to project management is to place the management at a level close to the client. OHM's project manager works directly with the client to achieve the client's satisfaction with the project. Therefore, the project manager will have overall project responsibility to the client from a schedule, cost, and resources aspect. OHM assigns a project supervisor to be responsible for accomplishing the work in the field. The project supervisor reports directly to the project manager. The project supervisor is responsible for the day-to-day activities in the field.

The project manager and site supervisor will jointly develop the project schedules and budgets and work to achieve these goals over the duration of the project. The schedule and budgets also include the resources required. The required resources will be reviewed with OHM's regional resource manager to schedule the necessary resources for the project. These activities are part of the initial planning activities and act as a baseline for measuring the progress of the project.

OHM will also provide a project control technician on site to assist the site supervisor in compiling the daily site costs and test results, and assist in procurement activities.

The proposed project organization is presented in Figure 2. The duties and responsibilities of the project team members are defined in Section 2.4.

2.4 PERSONNEL - DUTIES AND RESPONSIBILITIES

2.4.1 OHM Responsibilities

The responsibilities of OHM are:

- Perform the remedial activities defined in the Work Plan and required under this delivery order.

- Prepare and submit to the Navy monthly status reports containing such information regarding percentage of completion, unresolved delays (encountered or anticipated) that may affect the schedule and a description of efforts made to mitigate those delays or anticipated delays, revise construction schedule, listing of activities scheduled for the next month, and other information relating to the progress of construction as is customary in the industry.

- Initiate, maintain, and supervise all safety precautions and programs in connection with the work.

- If conflict, error, or discrepancy is found in contract documents,report to the Navy representative in writing before proceeding to obtain a written interpretation or clarification from the Navy.

- Notify the Navy representative in writing of any subsurface or latent physical conditions encountered which differ materially from those specified or indicated.

- Implement CQCP and establish chain of command.

- Conduct surveys for establishing pay limits and determining quantities for progress pay estimates; furnish Navy with one copy of all field notes of each survey.

- Provide a site supervisor, who will not be replaced without written notice to the Navy; the site supervisor will be OHM's representative at the site.

- If materials or equipment, or specific means, methods, techniques, sequence, or procedure of construction is indicated in or required by the contract documents, furnish or utilize a substitute acceptable to the NTR if needed.

- Procure subcontractor services; submit these services to the Navy for acceptance.

- Maintain at the site two record copies of all as-built drawings, one copy of specifications, addenda, written amendments, change orders, work directive changes, field test records, field orders, and written interpretations and clarifications. Upon completion of the work, deliver these records to the Navy.

2.4.2 Responsibilities of OHM's Project Team

The removal action at the Camp Allen Landfill - Area B site will be led by a project-dedicated team, as shown on Figure 2, who is responsible for the management and completion of the overall project and the primary components of design and remediation. The organization chart (Figure 2) defines the primary "chain of command."

The project manager will have the overall responsibility for project efforts including technical, schedule, and budget aspects. The project manager will be responsible for the day-to-day management and integration of all elements of the project and will be accountable for each activity. Supporting the project manager will be the project engineer for technical and site activities functions. Supporting the project manager in the field will be the project engineer, site supervisor, site safety officer, project control technician (PCT), and other support personnel as needed.

Separate from the project management chain of command is the QC chain of command under the direction of the QC engineer. The OHM QC engineer will work independently of the OHM project team.

Responsibilities and authority of the project manager and supporting field personnel fundamental to the project are discussed in the following sections. Responsibilities and authority of the QC engineer are discussed in Section 2.4.9.

2.4.3 Project Manager

The project manager is the person in charge of the overall project and has full authority for coordination and direction of the project. The project manager will communicate directly with the NTR. Specific responsibilities of the project manager include:

- Interpret and plan overall work effort
- Approve work products, plans, and deliverables
- Overall responsibility for preparation and planning of documents for the work
- Respond to resource requirements by defining resource needs and securing the commitments for staff and equipment
- Monitor subcontractor performance, schedules, budgets, and invoices
- Develop, review, and meet work schedule and budget objectives
- Ensure technical adequacy of field, laboratory, data management, and construction activities

- Prepare for and attend meetings with the Navy, as required
- Manage and coordinate group interfaces
- Document the need for contract modifications, if needed.

To carry out these functions, the project manager will have the authority to:

- Make work assignments for staff and subcontractors
- Allocate additional personnel as needed
- Establish work budgets and schedules with milestones
- Approve subcontractor work and invoices
- Communicate with the site supervisor about day-to-day activities and alert the program manager and/or the project engineer to potential problems
- Maintain OHM quality standards.

2.4.4 Project Engineer

The project engineer is responsible for performance of the technical aspects of the remediation and construction activities. Other responsibilities include:

- Day-to-day coordination of technical activities
- Provide technical guidance
- Ensure technical adequacy of field, laboratory, data management, and construction activities
- Interfacing with the project manager for engineering activities
- Acting as a focal point for coordination of engineering project deliverables
- Approving the appropriate project-specific procedures and the as-built drawings.

2.4.5 Site Supervisor

The site supervisor is the OHM contact at the site and is responsible for performing the remediation activities in accordance with the work plan and other project plans and specifications. The site supervisor's responsibilities include, but are not limited to:

- Implementing the day-to-day aspects of the HASP
- Coordinating engineering activities at the site as directed by the project engineer or project manager
- Managing the day-to-day execution of the project at the site including administrative and procurement activities
- Monitor work progress and schedule, and advise project manager of variances
- Implementing state and federal regulations pertinent to the work
- Assisting in preparation of work progress schedules, project reports, "as-built" drawings, and required compliance submittals
- Compiling the daily logs into a weekly report which will be forwarded to the project manager
- Attending work progress meetings
- Reporting to the project manager changes desired in the contract documents so that required review and approval can be accomplished prior to when the change is made, and reporting for review and approval changes necessitated by unanticipated site conditions
- Procuring, with approval of the project manager, subcontractor services
- Ensuring that remedial rework is subjected to the same quality requirements as the original work.

2.4.6 Site Safety Officer

The site safety officer (SSO) is responsible for implementing the HASP which satisfies federal, state, and local regulations and is consistent with site conditions. The site safety officer may take actions independent of the project group to stop the project, if required, for compliance with the HASP.

The site supervisor is responsible for the day-to-day implementation of the HASP during site activities. The site safety officer will oversee this day-to-day implementation, including the following responsibilities:

- Directing the entrance and exit medical physical requirements, if required
- Approval of personnel protective equipment and safety procedures specified in the HASP
- Overseeing the maintenance and use of field monitoring equipment necessary to define on-site hazards associated with remediation
- Designating appropriate personnel protection level; determining protection level upgrades and downgrades as site conditions permit
- Providing necessary guidance to the project staff so they can safely perform their functions in accordance with federal and state regulations.

2.4.7 Project Control Technician (PCT)

The responsibilities of the PCT are:

- Assist the project manager in preparation of schedules, budgets, and invoices
- Establish tracking systems to track costs and budget variances
- Provide weekly progress reports on budget and schedule status to the project manager
- Prepare daily report deliverables
- Audit weekly postings of charges to work budgets
- Assist the project manager in communicating work procedures and goals to OHM's staff
- Assist site supervisor in procurement activities.

2.4.8 Sample Technician

The responsibilities of the sample technician are:

- Performing all sampling activities in accordance with the approved protocols. Navy QA procedures are the approved protocols for this project.

- Assist the geotechnician with geotechnical testing, as needed.

2.4.9 Quality Control Representative

The QC representative is independent of the site project chain of command and reports to the Program QC Manager and works with the NTR.

The QC representative is responsible for coordinating inspection and surveillance activities. The QC representative will be supported in this role by a technician. The QC representative and the technician will monitor the full site activities on a periodic basis. The results of inspections and surveillances will be documented in a report describing the events reviewed that day. The QC representative will also be responsible for:

- Reviewing results of on-site verification testing and inspection reports.
- Implementing appropriate provisions of this plan.
- Serving as the collection point for remediation-related nonconformance.
- Perform, or cause to be performed, daily inspections and tests of the scope and character necessary to achieve the quality of construction outlined in the plans and specifications for work under the contract performed on or off site.
- Maintain the latest applicable drawings and specifications with amendments and/or approved modifications at the job site and assure that they are used for shop drawings, fabrication, construction, inspections, and testing.
- Maintain marked-up drawings at the site depicting as-built conditions. The drawings will be available for review by the government at all times.
- Maintain a contractor-generated submittal register, ENG Form 4288, for the duration of the contract. A review of the register will be performed at least every 14 days in conjunction with the scheduled dates on the register and in relation to the actual work status. Appropriate actions will be undertaken should slippages or other changes so necessitate.
- Review shop drawings and/or other submittals for compliance with the contract requirements prior to their transmission to the government.
- Establish and maintain a Rework Item List of work that does not conform to specifications. Track and monitor the items on the list to assure the rework inspection and testing activities and frequencies are in accordance with the contract requirements.

- Attend and assist the government at the pre-final inspection and the final acceptance inspection.

2.4.10 Transportation and Disposal Coordinator

OHM will assign a transportation and disposal coordinator to the project team to manage the transportation and disposal of the various wastes. The transportation and disposal coordinator will be responsible for preparing waste profiles and manifests, and for obtaining cost-effective transportation disposal options and disposal facility approval. The coordinator will work closely with the NTR.

2.4.11 Laboratory Responsibilities

The laboratory management team consists of the laboratory manager and the QA laboratory coordinator.

2.4.11.1 Laboratory Manager

The ultimate responsibility for implementing QA/QC within the laboratory resides with the laboratory manager. Many of the duties in fulfilling this responsibility will be delegated to other managers within the organization.

This responsibility includes, but is not limited to, the following:

- Act as the principal contact between OHM and the laboratory
- Support the laboratory coordinator to ensure that all analytical data are collected under in-control conditions
- Submit the weekly QC report through the OHM Program QC Manager to the NTR
- Upon notification by the OHM project manager of samples to be received, inform the laboratory coordinator of sample arrivals so the required analyses can be scheduled into the laboratory workload in such a manner as to meet the QC requirements contained in the CQCP
- Submit to the OHM project manager all pertinent information produced by the laboratory necessary to prepare the draft and final Reports for the project
- Track all samples and analyses that are submitted to the laboratory to verify that all work is being accomplished in a timely manner

- Support the laboratory coordinator, who coordinates sample transfer and analysis of all incoming samples from the field to the laboratory; the laboratory coordinator reports to the laboratory manager

- Support the laboratory coordinator to ensure the completion of the subcontractor work for the project is accomplished in a timely manner

- Verify that sampling procedures are adequate for the sample types received

- Oversee the quality of purchased laboratory materials, reagents, and chemicals to verify that these supplies do not jeopardize the quality of analytical results

- Ensure implementation of corrective action for any QA/QC deficiencies.

2.4.11.2 Laboratory Coordinator

The laboratory coordinator has the responsibility within the laboratory to establish, oversee, and audit specific procedures for documenting and controlling analytical data quality. Many of the procedures may be implemented by other individuals, but the laboratory coordinator must monitor that procedures are being implemented properly and the results interpreted correctly. The laboratory coordinator's responsibilities include, but are not limited to, the following:

- Monitor the QA and QC activities of the laboratory to verify conformance with authorized policies, procedures, and sound practices, and recommend improvements as necessary.

- Inform the OHM project manager, the laboratory manager, and the laboratory management of any nonconformance to their QA/QC program.

- Request analytical reference materials from the Navy, as needed, through the OHM Program QC Manager.

- Verify that all records, logs, standard procedures, project plans, and analytical results are maintained in a retrievable fashion.

- Verify that copies of standard procedures and project plans are distributed to all laboratory personnel involved in the project.

- Establish with the analysts, laboratory management, and the laboratory manager, the correct analytical lot size, the correct QC samples to be included in each lot, and the correct procedures for evaluating acceptable, in-control analytical performance.

- Verify that sampling is conducted in a manner consistent with the CQCP and other applicable Navy guidelines. This responsibility includes providing for a 1-day QA audit at the site to inspect the sampling and coordinating with the OHM project manager, the OHM QC engineer, and the laboratory manager as to the trip date and the name of the QA auditor. Each major type of sampling (e.g., water, soil) will be inspected at least once during the audit. The laboratory coordinator will document the inspection and verify that procedures described in the Scope of Work and Sampling Plan are followed. After obtaining approval from the NTR through the OHM project manager, the laboratory coordinator has the authority to require resampling of any site whose sample integrity was determined to have been affected by faulty sampling procedures.

- Verify that logging of received samples includes establishing appropriate lot size for each analysis and allocating sample numbers for the correct control samples in each lot.

- Review all laboratory data before those data are transmitted to permanent storage, or reported to other project participants. Before data are released, the laboratory coordinator must have completed a checklist and inspected calibration data control charts and other performance indicators to verify that the data were collected under conditions consistent with laboratory certification and that analytical systems were in control.

- Verify that analysts are preparing QC samples, maintaining control charts, and implementing and documenting corrective action when necessary.

- Verify that all sampling logs, instrument logs, and QC documents are maintained, are completed with the required information, and are documented at the required frequency.

- Review control charts produced by the data management group on a daily basis, discuss control chart results with the laboratory manager, and submit charts to the NTR on a weekly basis through the OHM Program QC Manager.

- Maintain an awareness of the entire laboratory operation to detect conditions which may directly or indirectly jeopardize controls of the various analytical systems (i.e., improper calibration of equipment, gross contamination through improper storage of samples).

- Audit sampling documentation and procedures to ensure that samples are labeled, preserved, stored, and transported according to prescribed methods.

SECTION
3.0

3.0 DESCRIPTION OF ACTIVITIES

3.1 SITE PREPARATION

3.1.1 Mobilization

OHM will mobilize the personnel, equipment, and resources necessary to complete the project as defined in this work plan. Initially, key individuals and equipment will be dispatched to the site to receive the trailers and other equipment essential to complete the project.

Initial site preparation will also include preparing the area where the contractor's trailer will be located, installing the contractor's trailer, and connecting utilities. Upon completion of the initial site setup, OHM will begin the second phase of site preparation which will include the mobilization of construction equipment necessary for intrusive activities. This will include, but not be limited to, mobilization of excavation, hauling, dewatering, and other water treatment equipment and all other equipment and personnel necessary to complete the project as outlined in this Work Plan. OHM will not mobilize a weigh scale as one is available at the Salvage Yard adjacent to the site. OHM will follow the requirements of Section 01010, Part 3.1.4 - "Availability of Weigh Scales"of the technical specifications. The project needs and logistics will be coordinated through our Trenton, New Jersey office. All initial and subsequent mobilization and site setup activities will be carried out according to Section 01010 - Project Schedule and Time Constraints, Part 1.8 of the SOW.

OHM will register with Base Policy Truck Investigation Team as outlined in Section 01010 - Extraordinary Security Requirements, Part 3.2.4.1.(a). OHM will provide markings on all rented or owned equipment which depict this equipment as OHM's. These markings will be painted or stenciled on the equipment in a conspicuous location. Rented equipment will be tagged identifying the party renting it and all equipment will be registered with the Truck Investigation Team as outlined in Section 01010, Part 3.2.4.1.(c) of the SOW. OHM will have the station permits for excavation, welding, and burning before commencement of any of these activities as described in Section 01010 -Station Permits, Part 3.3.2 - Station Permits, of the SOW.

3.1.2 Temporary Facilities

OHM will mobilize temporary facilities to accomplish the project objectives. These facilities are outlined in the following paragraphs.

3.1.2.1 Field Offices and Trailers

OHM will mobilize and setup one OHM office trailer and a personnel decontamination area(as outlined in the HASP) next to the contractor's trailer. OHM will

follow the requirements of Section 01010, Part 3.1.3 - "Trailers, Storage, and Temporary Buildings" and Part 3.1.3.1 - "Storage and Office Trailers."

3.1.2.2 Utilities

General

In general, OHM will follow the guidelines set forth in Section 01010, Part 3.1.1(c) as relating to disturbance of ongoing station utilities. The locations for the utility drops are indicated on Drawing RA-1.

Electrical

The government will supply the amount of electricity to OHM required to complete the work. A qualified electrician will be on site during the initial setup to connect to all available power to the temporary facilities. OHM will supply all equipment and labor necessary to connect, convert, and transfer the electricity as needed for various aspects of the project. Prior to any electrical utility hookups, OHM will complete all requirements of Section 01010, Part 3.1.1(b) - Availability of Utilities Services, and of Section 01010, Part 3.2.1.1(e) - "Utilities Interruptions". OHM will connect to the power supply pole (No. 26FCA128) indicated on the site plan. OHM will require single phase, 220-volt power. There are three 50 KVa transformers on the proposed power pole which provide 208Y120 power. OHM will provide the temporary power control. To accommodate this power load, OHM will provide an additional generator to provide backup power.

Water

OHM will be supplied with all potable and non-potable water by the Government through a fire hydrant located in close proximity to the site. OHM will provide all piping, hoses, connectors, fittings, pumps, backflow-prevention and metering devices, and all other equipment necessary to transport water where required. These hookups will be coordinated with the appropriate personnel as outlined in Section 3.1 - Facilities and Services, Part 3.1.1(a).

Telephone

OHM will follow the requirements of Section 01010, Part 3.1.1(d) as pertaining to telephone hookup. OHM will provide all equipment and labor necessary to connect telephone service to the site.

Sanitary Facilities

OHM will provide portable male and female sanitary facilities.

3.1.2.3 Haul Roads

OHM will construct temporary haul roads across the project site as necessary to accomplish the project scope. These roads will extend from the excavation areas to the drying pad. The decision to provide a temporary gravel surface for these roads will be made by the site supervisor and approved by the Contracting Officer once operations begin. The decision will be dependent upon mobility of the vehicles and the durability of the site soils. The haul road width will be 12 feet.

3.1.2.4 Project and Other Signage

OHM will place appropriate warning signs throughout the site where pedestrian and driver safety is in danger in the area of work to help establish both controlled zones and site hazards. OHM will take sufficient precautions and provide warning signs and/or flagmen during mobilization of larger pieces of equipment. OHM will follow the guidelines as outlined in Section 01010, Parts 3.2.1.1(d) and (d) concerning barricades and warning signs.

3.1.2.5 Work Zone and Temporary Fences

OHM will mark all work zones in accordance with Occupational Safety Health Administration(OSHA) guidelines. All specific work zones will be delineated with orange plastic fencing with metal posts and appropriate warning signs will be strategically placed. Caution tape, roping, and other fencing devices will be used as specific project tasks require. Although no permanent site fencing is proposed to be removed, if it is removed for any reason, OHM will erect temporary fencing to continuously maintain a physical barrier to site entry. The work zones are indicated on Drawing RA-1.

3.1.2.6 Fuel Storage Area

OHM will install fuel storage tanks within the Contractor Laydown Area as shown on Drawing RA-1 to provide fuel to perform the project activities. OHM will construct a berm encompassing the tank(s) large enough to contain the capacity of the tanks. Plastic or polyethylene sheeting will be placed under the area as well.

3.1.3 Crushed Stone Road

OHM will construct a new crushed stone surface to the existing site access road along the north boundary of the site, as shown on Drawing RA-1. The road will be constructed in accordance with Section 2610 - Gravel Paving, per the SOW, and Standard Specification 3.02 - Temporary Stone Construction Entrance, per the Virginia Erosion and Sedimentation Control Handbook.

3.1.4 Surface Water Management

OHM will perform initial grading and diversion dike or ditch construction to establish the necessary surface water management facilities. Temporary grading will be performed as necessary during site preparation and the removal action to ensure that the work zones are protected from runon during construction. The erosion and sedimentation control measures are indicated on Drawing RA-2 - Proposed Preliminary Excavation Contours.

3.1.5 Drying and Decontamination Pad Construction

The drying/decontamination pad will consist of a sectioned asphalt pad that will be sloped to drain to a sump area. One section will be for soil stockpiling/drying and the other for construction debris cleaning/decontamination. This pad will be approximately 100 feet by 80 feet and consist of approximately 4 inches of asphalt. Drawing RA-4 shows plan, section, and details of the drying/decontamination pad. In addition, a metal decontamination pad will be set up near the site access gate and will be used to decontaminate/wash the off-site haul trucks. Upon completion of project work, the asphalt pad and gravel base will be removed. Design calculations for the drying/decontamination pad are presented in Appendix B.

3.1.6 Preremoval Action Sampling

During the site mobilization work, but before actual removal work begins, a field crew will mobilize to take soil samples from the seven removal action areas as identified in the SOW and herein. The soil samples will be taken for hazardous waste determination to verify that excavated soils are nonhazardous and, therefore, acceptable to the disposal facility. Based on evaluation of data presented in the SOW for three borings (i.e., Sample SBC-1, SBC-2, and SBC-3), the soil is nonhazardous, however, the preremoval sampling and analysis will be performed for verification purposes.

The seven areas have been numbered by OHM as 1 through 7 and are depicted on Drawing RA-1. One composite soil sample will be taken from every 500 cubic yards (cy) of material to be excavated. Based on the preliminary excavation limits with 1 horizontal to 1 vertical cut slopes, approximately 4,600 cy will be excavated from the seven areas. Therefore, OHM has estimated that ten composite samples will be taken to represent the material being removed. The samples will be representative by taking composites from test pits. At least one test pit will be excavated in each of the seven areas. The samples will be analyzed for full TCLP analytes including volatiles, semivolatiles, and metals. In addition, the samples will be analyzed for RCRA characteristics - corrosivity, ignitability, and reactivity per 40 Code of Federal Regulations (CFR) Part 264, and PCBs. The sampling and analytical program is presented in the CSAP. The backhoe used for the excavation will be decontaminated in accordance with Section 4.0 after completing each test pit. The material removed for the test pit will be replaced after collecting the sample.

3.2 DEWATERING SYSTEM

OHM will install a dewatering system as part of the removal action for Areas 3, 4, and 5. The dewatering system is necessary because contaminated soil and debris must be excavated below the water table. The excavations will be dewatered to reduce saturated waste, and facilitate soil field screening and sampling, and to enable backfill to be placed and compacted as required in the SOW specifications. In addition, dewatering will help stabilize the excavation side walls which otherwise would be prone to sliding.

OHM will also use the dewatering system to dewater Areas 6 and 7. Area 6 is planned to be 8 feet deep, but only 30 feet square, and Area 7 is planned to be only 5 feet deep. As excavation progresses in these two areas, an effort will be made to use a sump pump to keep the trenches dry. If this is not successful, well-point systems will be installed. The general technique for well-point installation will be much the same as discussed for Areas 3, 4, and 5. However, at Area 7 the bottom of the trench is planned to be 25 feet wide, consequently it may be necessary to have two longitudinal header pipes to dewater the interior of the trench area. The proposed well-point system is flexible and can be installed quickly since the materials will be on site.

Dewatering of Areas 1 and 2 is not anticipated. Although Area 1 abuts a pond, the area is to be excavated to a depth of 1 foot. Based on OHM's review of the previous investigations, Area 1 contains primarily construction rubble and this would be removed by excavating the top 1 foot of soil. As such, OHM does not anticipate going deeper or encountering wastes at a low depth. If necessary, OHM will use a surface water (trash) pump to drain the excavation in this area to facilitate removal of the construction rubble and associated soil. If this is not sufficient, the situation will be reviewed with the NTR. Other possible alternatives are draining the pond by pumping the water out along its discharge channel. If necessary, dewatering points could be installed.

3.2.1 System Design for Areas 3, 4, and 5

To implement an effective dewatering system, the following factors were evaluated and used for the basis of design:

- Data from a constant-rate pumping test
- Logs of the subsurface formation and hydrogeological parameters
- Dimensions of the area to be dewatered
- Depths to which dewatering is necessary
- Distance to potential sources of recharge
- Duration of excavation/dewatering
- Relative timing of dewatering to excavation.

A constant-rate pumping test was conducted by Baker Environmental, Inc. in Area B. The following results were provided to OHM:

$$Transmissivity = 1{,}890\ gpd/ft$$

$$Storativity = 1.9 \times 10^{-3}$$

The hydrogeology at Camp Allen Area B has been described in reports completed by previous investigations. In brief, the stratigraphy includes a near surface unit of silty fine sand approximately 20 feet thick. This unit is underlain by a discontinuous clay bed approximately 10 feet thick. The clay bed acts as an aquitard which separates the shallow unconfined aquifer from an underlying confined aquifer.

Ground water movement in the shallow unconfined aquifer generally follows the local topography (north-northeast). The most recent available water table map of Camp Allen Area B (February 1993) indicates that the static water level is at a depth of approximately 3 feet.

The plan for remediating Areas 3, 4, and 5 includes the excavation of three trenches. These trenches are planned to range from 90 to 160 feet in length, 8 feet in depth, and 14 feet in width at the bottom. The entire area encompassing the three excavations measures about 230 feet in length by 150 feet in width. OHM proposes to lower the water table about 7 feet, assuming the static water level is at 3 feet, to accommodate the proposed excavations. OHM evaluated dewatering the entire area around the three areas and to maintain that drawdown through the entire time of the excavation and backfill activities. However, this may not be practical with the well-point system because of the moderate to high transmissivity of the unconfined aquifer. The volume of ground water to be pumped and treated would be too large to be effectively handled at a reasonable cost.

Initial indications are that Excavations 3 through 5 are 8 feet deep. The dewatering system will lower the static water level to about 10 feet below grade or 2 feet below the bottom of the excavations. Because the vertical and horizontal limits of excavation are preliminary and the extent of contamination may exceed these initial limits, the dewatered zones may also have to extend beyond the indicated preliminary limits of the excavations. Extracted ground water will be transferred to the on-site treatment plant prior to discharge to the Hampton Roads Sanitation District (see Section 3.3).

Based on the data presented above, OHM has designed a well-point dewatering system comprised of the following elements:

- Well points consisting of small-diameter riser pipe and well screen
- Header pipe and manifold system to convey extracted ground water produced by the well points

- Vacuum recovery pump capable of creating the required suction lift and subsequent drawdown of the water table.

To produce the drawdown necessary to dewater the trenches, the volume of water to be removed, the rate of removal, and the projected cone of depression were estimated as follows.

3.2.1.1 Volume of Water to be Removed

Based on the entire area encompassing the three excavation, and an effective porosity of 30 percent, the volume of water to be removed is estimated below:

$$V_w = 230\ ft \times 150\ ft \times 7\ ft \times .30 \times 7.481\ (conversion\ factor)$$

$$= \sim 542{,}000\ gallons$$

OHM will implement the dewatering system in phases, versus dewatering the entire area, to minimize the volume of water to be treated, reduce the size of the treatment plant, and lower the overall project costs.

Ground water extraction will progress gradually from the extreme northeast corner of the area encompassing Areas 3, 4, and 5 and progress southerly by bringing additional well points on line. This technique will be used because ground water flow is from the northeast and north toward the three areas. As excavations are completed they will be backfilled and the dewatering system will be phased out.

3.2.1.2 Rate of Removal

The ground water extraction rates for each area are calculated on the transmissivity value obtained from the constant-rate pumping test and pertinent hydrogeologic conditions. To ensure that the drawdown within the center of a rectangular trench is at 10 feet below grade surface, the extraction rate for a single pumping well is calculated using Darcy's Equation. The radius of the well will be 1 inch (to simulate a 2-inch-diameter well point) and a 10-foot radius for the cone of depression is used based on the constant-rate pumping test. These parameters were input into the following equation (from Driscoll, Groundwater and Wells, 1987):

$$Q = \frac{K(H^2 - h^2)}{1055 \log\left(\frac{R}{r}\right)} = \frac{94.5(17^2 - 10^2)}{1055 \log(10/0.083)} = 8\ gpm$$

where:

K = hydraulic conductivity, in gpd/ft^2, and is calculated by using T/b which is transmissivity, T, divided by aquifer thickness, b. K = 1,890 gpd per ft/20 ft = 94.5 gpd/ft^2
Q = discharge, in gpm
H = saturated thickness of the aquifer before pumping, in ft.
h = depth of water in the well while pumping, in ft.
R = radius of the cone of depression, in ft.
r = radius of the well, in ft.

The maximum withdraw rate is about 8 gpm. Assuming a well efficiency of 75 percent, a single well-point will extract 6 gpm which will achieve the desired drawdown when pumping over a sustained period of time.

When multiple pumping wells are used the drawdown effect is additive, thereby reducing the maximum yield required per well. In addition, the rate of removal is also influenced by the specific capacity of the well and the amount of time between initiating dewatering and beginning the excavation process.

The specific capacity observed during the constant-rate pumping test was 3.3 gpm for 7 feet of drawdown or Q/s = 0.47 gpm/ft. At a maximum pumping rate of 6 gpm, approximately 13 feet of drawdown would occur in the extraction well. Therefore, OHM will construct the well points to account for this maximum drawdown.

OHM will begin dewatering approximately 2 weeks prior to excavation. This will allow OHM to closely monitor and regulate the ground water extraction rate. Monitoring will be accomplished through the installation of 2-inch-diameter piezometers located near the excavation centerline. The ground water extraction rate will be controlled (1 to 6 gpm) to accommodate a treatment plant rated for a total flow of 75 gpm. The above calculations are presented in more detail in Appendix C.

3.2.1.3 Cone of Depression

The cone of depression observed during the constant-rate pumping test after 3 days ranged from 0.5 feet of drawdown at a distance of 10 feet to 0.25 feet of drawdown at 20 feet. Spacing the well points at 5-foot intervals, with each well pumping between 3 to 6 gpm, will create overlapping cones of depression. The greatest cone of depression will be at the well point and reduce increasingly with distance away from the well point. Therefore, a drawdown of 13 feet at the well point may be necessary to achieve the 7-foot drawdown at the excavation.

OHM will effectively dewater the areas of interest by using parallel well-point headers located along each long axis of the trench and one header located down the centerline of the trench. The purpose of the centerline header is to assist in removing water storage prior to excavation. Once the trenching operation has begun, OHM will remove the centerline header.

The remaining headers will maintain the drawdown since rate of removal is equal to the rate of recharge, which is considerably less.

3.2.2 Installation and Operation

The well-point dewatering system will consist of closely spaced wells connected to a header pipe or manifold. A centrally located vacuum pump withdraw ground water through the well points and header pipe by producing a partial vacuum, or suction lift. Specific components of the dewatering system are described below.

3.2.2.1 Well Points

Each dewatering well consists of a 15-foot length of 2-inch-diameter, galvanized steel riser pipe connected to a 3-foot-long screened well point. Well points are constructed of corrosion resistant galvanized steel mesh (60-gauge or 10-slot) and carbon steel drive points. This construction design will maximize well yield, minimize development time, and provide sediment free water. Dewatering well points will be installed by high-pressure (50-psi) jetting using a diesel-driven jet pump rated for 60 to 100 gpm. The well point and riser pipe are jetted down as a unit via an up and down movement of the whole assembly. The penetration rate is regulated by the pump valve and subsequent volume of water used. If excessive fluids are generated at the surface, they can be controlled via adsorbent booms, and containerized along with any sediments produced. No fluids or sediments will be collected during this process.

Following well-point installation, clean, coarse sand is added as a filter pack, via gravity emplacement. The filter pack will extend approximately 2 feet above the screened section of the well point.

After the filter pack is in place, the well is developed by mechanical surging using a plunger tool. No development water will be generated until the water treatment system is operating. This technique will ensure effective hydraulic communication with the aquifer and maximize well yield.

The installation of the well point will be performed under the immediate supervision of an OHM hydrogeologist, responsible for the proper setting and sealing of the wells.

3.2.2.2 Header Pipe

The header pipe is constructed of 6-inch-diameter aluminum pipe equipped with 2-inch-diameter ports. A typical header pipe is 20 feet long and contains 8 ports spaced at 2.5-foot intervals. Sections of header pipe are equipped with disconnect fittings to promote easy assembly and relocation in the field. The well points are connected to the header pipe via swing arm assemblies, that are constructed of PVC and flexible hose. Each swing arm assembly also contains an adjustment valve to regulate suction lift and balance the dewatering system during operation. The flexible hose is attached to the riser pipe using riser adapters and tapered nipples. The vacuum developed during system operation pulls the suction hose

and nipple together so they are air tight. This construction design promotes easy assembly to each well point and is capable of adapting to a wide range of field conditions by increasing or decreasing the number of well points per header.

Header pipes will be placed around the periphery of the location to be dewatered, with individual well points spaced along these lines at 5-foot intervals. In the interior of the location, at the site of each trench, three header lines will be installed. One line of well points will follow the proposed centerline of the trench, the other two lines will be positioned immediately outside of the ultimate edge of the trench (see Figure 3). These line locations should be considered preliminary until the trenches are located via test pits.

3.2.2.3 Vacuum Recovery Pump

OHM will use a diesel powered centrifugal vacuum recovery pump capable of generating 18 inches of mercury vacuum at 200 scfm. The unit is self-priming, electric, and mounted on a skid base. In addition, OHM will provide an auxiliary pump to augment the dewatering capability of the system (if warranted) and to serve as a standby pump in the event of equipment malfunction.

The vacuum recovery pump (receiver) is centrally located with each header piping system manifolded into the influent side of the pump. The extracted ground water is discharged from the effluent side of the pump and directed through 6-inch-diameter PVC pipe to the treatment facility. The vacuum receiver and operational sequencing of the well-point dewatering system are depicted on Figure 3.

During operation of the well-point system, the amount of drawdown is regulated by adjusting each well-point valve such that the pumping level is above the screened section of the well yet below the anticipated excavation depth. The composite cone of depression created by closely spaced wells will enhance the drawdown of the water table. Complete dewatering of the composite cone of depression could be accomplished within several hours. However, since the dewatering process is a function of gravity drainage, OHM will initiate the dewatering approximately 10 days prior to excavation to account for slower vertical drainage and delayed gravity drainage associated with fine-grained sediments.

Once excavation has begun, OHM will maintain the dewatering system to achieve peak performance and monitor subsurface conditions to evaluate effectiveness. Should additional dewatering be required to meet the target excavation depth, two options are available. The first option is to install a second stage header pipe and well-point system below and parallel to the elevation of the first stage by excavating to a lower tier along the perimeter of the trench. This second stage is connected to the existing or auxiliary vacuum recovery pump and operated until the desired drawdown is achieved. The second option is to install an 8-inch-diameter PVC screened sump within the trench to the desired dewatering depth using the excavating equipment. Bottom loading positive displacement dewatering pumps are set inside the sump with flexible discharge hose routed to the treatment system. The sump(s) are typically located at the end of the trench in order to maintain equipment accessibility.

To avoid increased particulate loading to the water treatment system due to the use of in-trench sumps, additional pretreatment equipment (filters, settling tanks, etc.) will be added to the system, or a polymer will be used to coagulate the sediment and collect it in the settling tank.

3.3 WATER TREATMENT AND DISCHARGE SYSTEM

A temporary water treatment system will be constructed to treat all water collected during on-site operations from the excavation, staging, and drying of contaminated source materials and decontamination of equipment and debris. Surface water and ground water will be collected from the following on-site sources within the work zone:

- Dewatering system for excavations
- Drying pad
- Decontamination pads
- Surface water controls, if any.

The water treatment system sizing is based on the flow estimate for the dewatering operations (see Appendix C for flow estimates). The dewatering operations will contribute the vast majority of the water to the total volume of water to be treated. The portions of the flow contributed by the drying and decontamination operations will be small compared to the portion contributed by the dewatering operations. The flow estimates for the dewatering operations in Areas 3, 4, and 5 (the largest dewatering operation) indicate that a maximum flow of 75 gpm will be necessary for effective dewatering. By using this maximum flow estimate, it is assumed that the small flows from the drying and decontamination operations can be neglected. The water treatment system is sized on the basis of 75 gpm.

The influent and effluent lines for the treatment system will be 4-inch flexible hose. The water from the drying pad and the decontamination pads will be pumped to a 5,000-gallon transfer tank and then from the transfer tank to the surge tank located in the water treatment area. The influent and effluent lines for the treatment system are shown on Drawing RA-1. Water collection from the dewatering system is described in the Dewatering System, Section 3.2.

The treatment system will consist of metals, suspended solids, and organics removal prior to discharge to the sanitary sewer. Hydroxide precipitation will be used to remove metals from the water. This precipitation will be a three-step process. In the first step, hexavalent chromium will be converted to trivalent chromium with the addition of sulfuric acid into a mixing tank. The addition of sulfuric acid will depress the pH to a range of 2 to 3. From here, the water flows to the second step where lime is added to the water in a second mixing tank to form metallic hydroxides. The addition of lime will raise the pH to the 9 to 10 range. The mixed flow is then conveyed to a settling tank where metallic hydroxides are precipitated. The precipitated sludge in the settling tank will be drawn off and placed in drums for disposal. From the settling tank, the treated water will be pumped to bag filters to remove residual suspended material. From here, the water is conveyed to the carbon adsorption cells for removal of the organic materials.

Organics removal will consist of activated carbon adsorption. There are two reasons for choosing carbon adsorption alone over air stripping followed by carbon adsorption. First, the analytical results in the SOW only show one sample for volatile organics that is above the discharge limits (B-MW11A for 1,2-dichloroethene on June 11, 1992). The carbon is sufficient to remove the low concentrations of organics present. Second, carbon adsorption alone does not require permitting for an air discharge. The activated carbon cells will be oversized so that carbon changeout during operation will be unnecessary. Upon completion of water treatment, disposal of activated carbon will be a part of site demobilization and project transportation and disposal.

The treatment system effluent will be discharged to the sanitary sewer system of the Hampton Roads Sanitation District (HRSD). The discharge point will be Sanitary Manhole CA-113H as shown on Drawing RA-1. HRSD has set the following discharge limitations for the effluent from the treatment system:

Contaminant	*Discharge Limit (mg/l)*
BTEX	1.0
Arsenic	0.1
Barium	2.0
Lead	1.0
Chromium	2.0
Cadmium	0.1
Zinc	2.0
Acetone	2.5
Total Toxic Organics	2.13[(1)]

[(1)]With no single organic exceeding 1.0 mg/l per 40 CFR 433.11(e).

These limitations are based on the Clean Water Act "Indirect Discharge Requirements" (40 CFR 403), the Commonwealth of Virginia Permit Regulations (VR-680-14-01, Section 7), and HRSD Industrial Wastewater Discharge Regulations (Part III and Appendix D).

Operation of the treatment system is intended to be on a continuous-flow basis, but if there is less water collected than is anticipated, then the system may be operated on a batch basis by allowing the surge tank to fill up prior to turning the treatment system on. The quantities of sulfuric acid and lime solutions used for pH adjustment during operation are highly dependent on the alkalinity content of the water. These quantities will need to be

determined during system startup. The quantity of sludge generated during metals precipitation is, in turn, highly dependent on the amounts of chemicals used for pH adjustment.

If, as suggested by analytical results of samples taken during the pump test, metals are generally attached to suspended particles and will be removed through sedimentation and filtration alone, OHM will turn off the chemical feed pumps for the sulfuric acid and lime solutions. This would greatly decrease the amounts of metals sludge that are being generated. A bypass around the chemical mixing tanks will also be provided.

A process and instrumentation diagram of the water treatment system is presented on Drawing RA-7. The water treatment system will consist of the following units:

- A 20,000-gallon surge tank
- Two 1,000-gallon mixing tanks with chemical metering pumps
- A 10,000-gallon settling tank
- Two bag filters operated in parallel
- Two 10,000-pound activated carbon cells
- A 10,000-gallon effluent holding tank
- Sampling ports before each unit and in the effluent line.

The equipment provided for the water treatment system will meet all requirements of standard practice. The assumptions and calculations for this treatment system are presented in Appendix D. A detailed materials list is presented in Appendix E.

If the quantities of metals sludge being generated during operation indicate that sludge dewatering prior to disposal would be cost effective, OHM can quickly mobilize a filter press to the site. Additionally, if influent samples indicate that organics concentrations are higher than the ground water analyses currently show, OHM can mobilize an additional carbon cell to the site.

OHM requires a 220-volt, single-phase power connection for the water treatment system. There are three 50 KVa transformers on the proposed power pole which provide 208Y120 power. OHM will provide the temporary power control panel to accommodate this power load. The daily power consumption is estimated to be in the range of 300 to 400 kW-hours.

The individual treatment units will be mobilized to the site on skids. During site setup, these units will be leveled on a 6-inch bed of pea gravel. The piping within the treatment system will consist of 4-inch flexible hose.

Per the SOW, OHM will sample the influent to the water treatment system. Influent samples will be taken from the surge tank and effluent samples will be taken from the effluent holding tank. The results of analyses for these samples will provide the following information:

- Verification of compliance with discharge limitations
- Information to compute removal efficiencies.

Sample frequency, sampling methodology, and analytical methodology are presented in the CSAP.

During operation of the treatment system, the full length of the influent lines will be inspected twice per 8-hour work shift and the full length of the effluent lines will be inspected once per 8-hour work shift by site personnel. The purpose of this inspection is to ensure that the flexible hose has not been damaged by site equipment.

3.4 REMOVAL OF EXISTING DRUMS

3.4.1 Description

This section describes the procedure for bulking the on-site drums of investigative-derived wastes. The investigation-derived waste drums contain decontamination liquids, personal protective equipment solids, and Camp Allen Salvage Yard Wastes and Area B characterization wastes. There are approximately 388 drums which are presently stored on pallets near the site access road, as shown on Drawing RA-1 - Site Operational Plan. Sixty-seven of the 388 drums reportedly contain liquids. The drummed liquids were generated from previous well development/purging and decontamination activities which will be treated on site through the water treatment plant. The remaining 321 drums reportedly contain soils and other solids (i.e., used PPE) which will be handled based on their designation as hazardous or nonhazardous. This designation will be determined according to the drum sampling plan presented in Section 5.0 of the CSAP.

OHM will use existing analytical data from the Navy (Baker Environmental, Inc.) to help characterize the drums. Disposal approval for these drums will be based on TCLP testing results and other existing data. Upon receiving disposal facility approval and Navy approval, OHM will proceed with transportation and disposal of these drums.

Since the drummed solids are strictly from the Camp Allen Landfill area and there has been analytical work performed on the soil, there is no need to consider anything but an unlabeled drum as an unknown. Some additional drum sampling may need to be conducted in the event any drum is not labeled. It is believed, however, that all 388 drums are labeled. The drum sampling plan will be implemented to classify the IDW as hazardous or nonhazardous. See Section 5.0 of the CSAP.

After drums have been characterized and subsequently are emptied, the drums will be rinsed at the main decontamination pad. Rinsed drums will be staged on site for transport to a drum recycler. Rinsate from drums will be treated in the on-site water treatment plant. The materials, equipment, and preparation activities for drum handling are discussed as follows.

3.4.2 Materials

Materials and equipment required for removal and disposal of 388 on-site drums are as follows:

- Hydraulic excavator with drum grappler attachment
- Pallets
- Plastic or polyethylene sheeting
- Drum staging area
- PPE (as per the site HASP)
- Data from the RI report, as well as drum logs
- New data (e.g., TCLP) to be collected during project work activities
- Fork lift.

3.4.3 Preremoval Preparation Activities

Prior to physical removal of any waste from the 55 gallon IDW drum area, OHM will construct a drum staging area, as shown on Drawing RA-1 - Site Operational Plan. This staging area is located in close proximity to the material stockpile area and drying pad to minimize the distance that the materials need to be transported. Also, as seen from Drawing RA-1, the distance from the drum staging area to the present location of the drums is minimized.

A small, temporary transport ramp will be constructed over the existing railroad tracks to provide access to the drum staging area. Upon completing the drum transfer to the staging area, the ramp will be removed and the area will be restored to its previous condition. Gravel will be used as the ramp construction material.

3.4.4 Execution

The following outlines the procedure for transferring the drums to the drum staging area and removal of drum contents to the appropriate staging/treatment area:

- OHM will use the existing analytical information from the RI Report to evaluate drum contents prior to transferring the drums to the drum staging area (according to the site HASP).

- The analytical data from the RI Report will also be used to obtain waste disposal approval.

- Preparation of the drum storage area for acceptance of drums (placement of pallets, sheeting, etc.).

- Transporting drums to the drum storage area via forklift or approved equivalent piece of equipment.

- Placement of plastic sheeting over stockpiled drums to protect drums from adverse weather.

- Removal of solids (investigation-derived soils, used PPE, and Camp Allen Salvage Yard wastes) from drums and placement on the drying pad area. These solids will be stockpiled with potentially impacted soils excavated from the seven remediation areas.

- Removal of liquids (well purge water and development water) from drums to the 20,000-gallon storage tank for treatment in the on-site treatment plant.

- Transfer empty drums to decontamination pad for rinsing and staging.

- Loading of drums for recycling.

3.5 SOIL AND DEBRIS REMOVAL

This section details the work to be completed as part of the soil and debris removal task for Area B at the Camp Allen Landfill. This task includes the following activities:

- Establish initial excavation limits using a tape measure and the site physical monuments

- Define preliminary excavation limits

- Dewatering of the excavations (as necessary)

- Excavation and disposal of soil and construction debris

- On-site water treatment

- Confirmatory sampling

- Common backfill placement.

The following sequence of construction activities will serve as a guide for conducting the work associated with this task and will be modified as necessary to accommodate changes in site and weather conditions and/or scope of work.

- Define preliminary excavation limits and install erosion and sedimentation control measures

- Excavate the soil and debris and load it into trucks

- Haul excavated soil and debris to screening area

- Screen excavated soil to separate soil and debris
- Perform real-time air monitoring during soil/debris removal
- Treat on-site water from dewatering activities
- Post-excavation confirmatory sampling
- Common fill placement
  - Load and transport borrow material
  - Fill placement and compaction
  - Dust control
  - Geotechnical testing
  - Final grading
- Wetlands restoration
- Seeding of graded areas.

The above-listed activities will overlap in time to provide for an efficient task duration schedule. However, the majority of these activities are weather dependent and, thus, the duration of these activities will be governed by weather conditions. The proposed construction schedule for the project is presented as Figure 4 and is discussed in Section 5.0.

3.5.1 Clearing and Grubbing

OHM will remove from the site and properly dispose off site only vegetation that impedes or interferes with the safe and effective implementation of the tasks and requirements of the site work. This vegetation will include, but not be limited to, trees, weed growth, brush, shrubs, logs, roots and leaves, as well as other debris.

3.5.2 Soil and Debris Excavation

OHM will notify ROICC 48 hours prior to the start of excavation activities. Excavation activities will begin on June 17, 1993, and will be completed no later than September 2, 1994. Excavation of impacted soil and debris will consist of the removal of material from seven preidentified areas as shown on Drawing RA-1. These areas were designated by OHM as Areas 1 through 7. The excavations will range in depth from a proposed 1 foot (Areas 1 and 2) to a proposed 8 feet (Areas 3 through 6). Area 7 will be excavated to a proposed depth of 5 feet. The excavations will generally conform to the shapes as shown on Drawing RA-2. The vertical and horizontal excavation limits are based on the preliminary limits per the SOW. The preliminary horizontal limits, however, will be modified in the field to 1V:1H cut slopes, initially, to accomplish work activities. Excavation beyond these limits will depend on the results of the field screening and confirmatory sampling.

Based on the existing site data, the subsurface soils are soft, loose, and wet. To accomplish the excavation, OHM will implement the dewatering plan discussed in Section 3.2 to lower the water table within and around the excavation to allow:

- Slope excavation sidewalls to 1V:1H. The excavation sidewalls may be reduced to a grade of 1V:2H if the former grade cannot maintain stability.

OHM is proposing to establish side slopes in all cases, but will be prepared to install shoring under the following circumstances:

- The advancement of the excavation begins to adversely affect the stability of off-site structures (roads, buildings, railroad tracks, etc.)
- The excavation becomes excessively large due to sloughing/sliding of the trench materials
- Only if directed by the NTR.

Providing shoring will require at least two weeks notice which may impact the project schedule with down time. OHM will do whatever work is available while awaiting shoring installation. OHM will identify a shoring subcontractor during the cost estimating phase, and will maintain communications with the subcontractor regarding the schedule for potential shoring work in order to reduce and, at best, prevent project down time.

Removal activities will continue until all debris and visually-stained soil is removed to the proposed depths. During removal activities, if excessively large pieces of debris are encountered, OHM will be prepared with metal shears, concrete saws, or jack hammers to breakup the material into manageable pieces. Once the debris and any visually stained soil is removed, OHM will perform field screening to assess organic vapors according to the Contractor Sampling and Analysis Plan (CSAP). If the level of organic vapors exceeds 50 ppm, OHM will consult the NTR to determine an additional amount to be excavated and define the location of the additional excavation. Additionally, an electromagnetic scan will be performed to ensure all metallic objects have been removed from the excavation. If the magnetometer registers additional metal below the proposed depth of the excavation, OHM will advise the NTR and receive the NTR's approval before beginning any additional excavation.

OHM will excavate the material and directly load it into trucks to haul it to the drying pad area. OHM is anticipating that any debris encountered can be accommodated by the hydraulic excavator bucket. OHM will use a vibratory screen to segregate debris from the soil. This operation will occur in the area adjacent to the drying pad. The trucks will dump their loads, a front end loader will feed the screen, and conveyors will transport the debris and soil to their separate staging areas.

After the excavation passes the analytical field screening procedures, confirmatory sampling of the base and at the midpoint of the sidewalls of the excavation will then be performed as outlined in the CSAP. If the results from analytical testing shows that the samples are in compliance with Section 02220, Paragraph 1.2.4 of the Technical Specifications, excavation will cease and backfilling will begin with the NTR's approval. Otherwise, excavation will continue as directed by the Navy's technical representative. Confirmatory sampling will be conducted again. This procedure will continue until the cleanup levels have been met or until the Navy's technical representative stops excavation. Backfilling will be performed in accordance with Section 5.3 and Section 02220, Paragraph 3.4 of the Technical Specifications. All on-site equipment used for removal activities will be registered and marked in accordance with Section 01010, Paragraph 3.2.4. All data will be reviewed with the NTR and approval received before OHM begins backfilling operations.

Additionally, Monitoring Wells GW-4, GW-5, B-MW5B and WELL5 will be removed as follows: the steel protective casing and as much of the of the PVC riser pipe as possible will be pulled. The hole will then be grouted via a tremie pipe with a cement-bentonite grout from the bottom up.

3.5.2.1 Material Segregation

Two types of materials will be handled during the removal activities, i.e., impacted soil and debris/construction rubble. During excavation and prior to the materials being placed on the drying/decontamination pad, it will be necessary to segregate the materials. Segregation will be achieved by passing all excavated material over a 4-inch mesh vibratory steel screen to be located adjacent to the drying/decontamination pad. Any material that does not pass through the screen will be considered construction rubble and will be placed in the construction rubble stockpile located on the drying/decontamination pad. Material that passes the screen will be considered to be impacted soil and will be conveyed to the drying pad. Hauling within the site will be with off-road trucks. OHM intends to have waste disposal preapproved; therefore, once the excavation activity begins, the waste will be loaded onto trucks for transport to the landfill on a daily basis.

3.5.2.2 Drying and Decontamination Pad Operations

The construction of the drying pad and decontamination pad is as previously discussed in Section 3.1.5. The operations to be performed on the pads are briefly discussed as follows.

Decontamination of vehicles, equipment, and/or debris will be performed with a high-pressure water wash. Decontamination procedures are discussed in Section 4.0.

Soils placed on the drying pad will be allowed to drain free water to facilitate disposal. Excess water from partially or nearly saturated soils will be collected into the sump and then transferred to the on-site water treatment plant. Soils placed on the drying pad will be covered with a plastic sheeting during rain periods, and during nonworking hours. After the free water has drained from the soils, the soils will be available for shipping off site.

3.5.2.3 Field Sampling and Screening

Field sampling will be in accordance with the CSAP and Section 02220, Paragraphs 1.2.4, 3.2.2.4, and 3.2.2.5 of the Technical Specifications included with the SOW.

3.5.3 Backfill and Compaction

Backfilling operations will begin as soon as possible after OHM receives analytical data from confirmatory sampling that shows the excavation has met the cleanup criteria and upon approval from the NTR. Prior to any imported fill being placed, OHM will use a bulldozer or excavator to cut back the excavation slopes to 1V:2H. This will put the excavation in compliance with OSHA standards and allow compaction and testing of the backfill. All material from the cut will be used for the initial lifts of backfill in each excavation. Once the slopes are graded and all on-site material is satisfactorily compacted, fill will be imported from the Navy borrow area to complete the backfilling operation.

OHM will contact Public Works Center (PWC) to setup an account for all materials removed from the government borrow area prior to utilization. Loading of materials will be handled by OHM personnel using a rubber-tired, frontend loader. OHM will subcontract the hauling of material by dump truck to a local subcontractor (proposed SBE).

Prior to loading the backfill onto any truck, initial measurements of the truck bed will be obtained. These measurements will be used for calculating the volume of material used each day. A material requirement/usage schedule will be submitted to PWC 2 weeks prior to material utilization. The schedule will be updated weekly throughout the project. Samples of the fill will be obtained for initial classification and density testing to verify satisfactory compliance with the Technical Specifications. Also, this data will be used during backfilling operations to ensure compliance with specified compaction criteria. All trucks used for hauling material to/from the project site will be registered with the Base Policy Truck Investigation Team at (804) 445-1464 prior to entering the Norfolk Naval Base. All trucks used for off-site hauling will also travel through the decontamination station at the site access gate to have their tires decontaminated for each haul cycle.

3.5.3.1 Borrow Area

OHM will use fill material from the government borrow area which is located between the Willoughby Housing Area and Interstate 64. OHM will comply with all requirements set forth in Section 02220, Part 2.1.2.1 - Backfill and Fill Material (Government Borrow Area).

3.5.3.2 Borrow Transport

OHM will provide the necessary personnel and equipment (either in house or subcontractor) to load the select material into OHM-controlled trucks from 9:00 a.m. to 3:00 p.m., Monday through Friday. OHM will comply with all rules and regulations required by the Public Works Center (PWC) in the operation of the government borrow area.

3.5.3.3 Compaction

Fill will be placed in 12-inch loose lifts and compacted to 85 percent of Standard Proctor Maximum Density for all cohesionless soils. The lift will be wetted, as needed, to be within 4 percent, plus or minus, of the optimum moisture content as determined by ASTM D-2216. Cohesive soils will be compacted to 80 percent of Standard Proctor Maximum Density.

Compaction of fill material will be performed by using a nominal 10-ton, smooth-drum, vibratory roller. In areas that are not accessible to a roller, mechanical hand tampers will be used. Compaction of fill will be monitored using Nuclear Density Methods in accordance with ASTM D2922 and D3017. Compaction tests will be performed at frequencies in accordance with the Contractor Quality Control Plan. Placement and compaction of fill material will continue in 12-inch lifts until the top of the excavation can be graded to accommodate the proposed drainage pattern indicated on Drawing RA-3. OHM will follow all requirements of Section 02220, Part 3 with respect to the execution of filling.

3.5.4 Site Restoration

Upon completion of the project, all areas disturbed by OHM will be regraded and reseeded before demobilization is completed. The purpose of this activity is to restore the area to as natural a condition as practicable, to encourage the growth of the natural flora and to minimize environmental damage during the post construction period.

3.5.4.1 Final Grading

Final grading of the site will follow the lines and contours presented on Drawing RA-3 to within ± 2 inches or to the grade directed by the NTR. Areas to be graded will include all setup and support areas, access roads, haul roads, and other areas that have been disturbed as a direct result of construction operations.

3.5.4.2 Seeding

Seeding and mulch will be applied to all disturbed areas. These items will be placed according to Specification Section 02220 - General Excavation, Filling and Backfilling, and Section 02950 - Wetlands Area Shrubs, Plants and Grass.

The seed mixture to be placed on the non-wetlands graded areas is to match existing vegetation. The plantings for the wetlands area (Area 1) is defined in the above-mentioned specifications (see Appendix F).

3.5.5 Final Inspection

Final acceptance of the project will be based on a final inspection of the project site. The Navy will be given 14 days advance notice of that inspection. This inspection will be conducted by the OHM QC engineer, site supervisor, and the NTR. A complete list of deficiencies discovered during that inspection will be submitted to the Navy within 5 days of

the completion of the inspection. A date to complete corrections to each deficiency will be included on the list.

After OHM has completed correcting all deficiencies on the final inspection list, and any other deficiencies discovered after the inspection, the NTR will be offered an opportunity to inspect these areas before OHM demobilizes from the site. The purpose for this inspection is to verify that all tasks detailed in the contract have been completed to the Navy's satisfaction and that all previously identified deficiencies have been rectified. At the completion of this inspection, there should be no incomplete or unacceptable work remaining. The completion of this tour should constitute final acceptance of the project and the maintenance period will begin on that date.

3.6 TRANSPORT AND DISPOSAL OF WASTES

The transportation and disposal of all site-related wastes will be performed as discussed in the following sections.

3.6.1 Disposal of Soils and/or Debris

According to the data provided for soil samples SBC-1, SBC-2, and SBC-3, the soils on this site will not be classified as characteristically RCRA hazardous. OHM will do additional preremoval action sampling to verify this condition and to gather waste samples for disposal facility approval. Soils and/or debris generated on this site will be disposed of at an approved facility to be determined based on the preremoval analytical results. The OHM transportation and disposal coordinator will complete all waste profiles and send them, along with representative sample and analytical data, to the disposal facility for their approval prior to beginning the excavation activities.

If the analytical data shows them to be compatible, OHM will consolidate the miscellaneous solid investigation-derived wastes into the soil/debris wastestream destined for off-site disposal. This wastestream will also contain all protective equipment and other site-generated debris collected during the course of the project. OHM will obtain waste disposal approval prior to beginning excavation activities. Therefore, as material has dried on the pad or debris is available, the wastes will be hauled off site. OHM anticipates a daily removal of wastes.

3.6.2 Transportation of Soils and/or Debris

OHM will utilize 20-yard dump trailers for shipping the soil/debris waste to the selected landfill. OHM personnel will inspect each vehicle as it enters the site to ensure there are no holes or damage to the trailer bed, and will also check that all necessary permits are with the vehicle. Once loaded, OHM will decontaminate each truck prior to its being allowed to leave the site. All trucks will be weighed at the salvage yard scale and will receive copies of weigh tickets prior to leaving the project site. The OHM PCT will collect one copy of the weigh ticket from each truck.

Either nonhazardous waste manifests or uniform hazardous waste manifests will accompany each vehicle. OHM will complete all manifests and land ban certifications for prior approval from the Navy before trucks are mobilized to the site. The COMNAVBASE environmental representative will sign the appropriate paperwork at the work site. OHM will provide the CNB 24 hours notice that a signature is needed. OHM will be responsible for obtaining the signature, not the NTR.

3.6.3 Disposal of Investigation-Derived Liquid Waste

OHM will consolidate the liquid wastes and treat them on site using OHM's on-site wastewater treatment system. The liquid wastes include decontamination water, ground water collected from the dewatering operation, and drummed liquids.

3.6.4 Disposal of Empty Drums

OHM will recycle all empty drums generated from the consolidation of investigation-derived wastes. Trucks hauling empty drums need not be weighed before leaving the site.

3.7 DEMOBILIZATION AND MAINTENANCE

OHM will demobilize labor, equipment, and materials from the site upon completion of work activities and after having met the project objectives. Demobilization will occur in stages as various work activities are completed. Demobilization will include those activities discussed below.

3.7.1 Remove Dewatering System

Upon completion of all backfill and site grading activities, the well point system will be removed and all appurtenant dewatering equipment (i.e., flexible, hose, couplings, pumps) will be disassembled.

3.7.2 Decontaminate Site Equipment

Site equipment will be decontaminated per the decontamination procedures of Section 4.0. After all equipment is decontaminated, the decontamination facilities will be dismantled.

3.7.3 Remove Water Treatment

After the collected water has been treated, the on-site treatment plant will be dismantled.

3.7.4 Site Cleanup

Utilities will be disconnected as they are no longer needed. The site supervisor will verify the site is clean and restored to a level acceptable to the NTR before demobilizing the remaining site resources.

3.7.5 Demobilize Resources

All equipment will be inspected for proper decontamination prior to leaving the site. All left over materials will be removed from the site.

As site equipment is no longer necessary, it will be decontaminated and demobilized from the site.

- Dewatering equipment
- Water treatment equipment
- Construction equipment (excavator, trucks, loaders, etc.).

The following personnel will be utilized to demobilize the equipment and materials and return them to the OHM office:

- Operations foreman
- Equipment operators
- Electricians
- Recovery technicians
- Truck drivers.

3.7.6 Maintenance Program

Maintenance of the site will be performed 4 weeks after acceptance of the work by the Navy. The following items will be performed during the maintenance visit:

- Inspect the excavated areas for settling and erosion
- Inspect the wetlands area for vegetative growth and erosion
- Repair settlement and erosion as directed.

The NTR will receive 7 days' written notice prior to the inspection. The inspections of the site will be performed and any noted deficiencies will be corrected to the satisfaction of the Navy. A written report will be provided to the Navy within 2 weeks of the inspection. Proposed corrective actions will be noted in the inspection report. OHM will obtain Navy approval prior to performing the corrective action.

The appropriate types of materials, equipment, and manpower will be supplied in sufficient quantity to efficiently and effectively repair any deficiencies identified during the inspection. A partial listing of the equipment and materials that may be furnished is as follows:

- Equipment
  - Pickup trucks
  - Hand tools

- Materials
  - Random fill
  - Topsoil
- Wildlife seed mixture
- Lime and fertilizer
- Erosion control materials
- Rock riprap.

The exact equipment and materials dispatched for any single maintenance incident will vary with the required task and the severity of the damage to be repaired. Similarly, the size and skills of the crew that is dispatched will depend on the nature and extent of the required repairs. The minimum crew size for any on-site activity, including site inspections, will be two persons. The minimum crew size is set at two persons for safety reasons and at no time will one person be permitted to remain and work on site alone for any reason.

3.8 FINAL REPORT

A final engineering report will be written and finalized within 30 days of project completion and furnished to the Navy. The 30 days will commence on the first day after the final inspection has been completed. The complete final engineering report will contain the following items:

- Executive Summary of Action
- Summary of Record Documents
- Project Description
- Field Investigation Summary
- Field Changes and Project Modifications
- Discussion of Remediation Activities Performed
- Analytical Data
- Materials Testing Data (CQ)
- As-Built Drawings
- Final Health and Safety Report
- Off-Site Disposition of Materials
- CQ Summary Report.

Two complete and separate sets of construction drawings will be maintained in the field. These drawings will indicate the current project status and any deviations from the project plans.

3.9 FIELD PROCEDURES

3.9.1 Trip Report

Prior to beginning the site work, OHM's project manager and site supervisor will perform a reconnaissance survey of the project site with the COTR and the NTR. The survey will define areas of concern by the NTR and OHM's proposed method to alleviate the concerns. The survey was performed during the initial site visit with the Navy PPM. A trip report was previously prepared, dated November 1993, and submitted to the Navy.

3.9.2 Daily Safety Meeting

OHM supervisory personnel will hold daily tailgate safety meetings to advise the workers of proper methods of performing the work planned for the day. The topic of discussion will be listed on a sign-in sheet and the PCT will ensure everyone present signs the sheet which will be kept as a record of the meeting.

3.9.3 Status Reports

The OHM project manager, with assistance from the site supervisor and the PCT, will prepare monthly status reports for the current condition of the project. The status reports will include a Technical Progress Report, Cost Performance Report, Modification Log, Project Schedule, Government Materials Tracking Report, Variance Analysis Report, and a Waste Materials Report.

3.9.4 Noncompliance Checklist

OHM's CQC representative will prepare and submit to the NTR on a monthly basis a list of noncomplying work (Rework Item List).

3.9.5 Daily Report/CQC Report

OHM's CQC representative will prepare and submit to the NTR on a daily basis (every day that work is performed) the Daily Report to Inspector/CQC Report (DRI/CQC Report). The DRI/CQC Report will be submitted by 10:00 a.m. the following day. A copy of the daily report will be sent to the OHM project manager daily and a copy will be maintained on site.

3.9.6 Test Results Summary Report

OHM's CQC representative will prepare a summary report of all field tests containing both "required" and "actual" results plus "passed" or "failed" for conforming, nonconforming, and repeated test results. The report will be submitted to the NTR and OHM project manager at the end of each month.

3.9.7 Submittal Status Log

The CQC representative will prepare and continually update a Submittal Status Log to document quality control for materials, inspection, and testing. The Submittal Status Log will be maintained on site and available for government review.

3.10 PERMIT REQUIREMENTS

OHM will obtain the permits necessary to perform work activities. For on-site work, an excavation permit (station permit) will be obtained from the Public Works Officer, Utilities Division. OHM will also contact the proper officials as necessary to verify the location of any underground utility lines to ensure that it is safe to excavate. A confined space entry permit (see HASP) may be completed at OHM's discretion and with concurrence from the NTR, although the planned work does not anticipate any confined space entry. A welding and burning permit (station permit) may be acquired from the Base Fire Marshall, although this is not anticipated.

For off-site transportation and disposal of waste materials, OHM will acquire solid waste and hazardous waste disposal permits and appurtenant forms. All vehicles hauling waste will carry the proper waste manifests and placards required by the U.S. Department of Transportation.

SECTION
4.0

4.0 PROCEDURES FOR DECONTAMINATION

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when leaving the work site, either at the end of each day, during scheduled breaks, and/or upon completion of the project.

4.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the general decontamination procedure. The specific stages will vary depending on the site, the task, the protection level, etc.

- Go to end of EZ
- Wash outer boots and gloves in detergent solution
- Rinse outer boots and gloves in water
- Remove outer boots and let dry
- Remove outer gloves and let dry
- Cross into CRZ
- Wash splash suit
- Rinse splash suit
- Remove splash suit and let dry
- Remove Saranex Tyvek suit and discard
- Remove sample gloves and discard
- Remove and wash respirator
- Rinse respirator and hang to dry
- Remove sample gloves and discard
- Remove Tyvek and discard
- Remove booties and discard
- Remove sample gloves and discard.

4.1.1 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. There, the worker will remove clothing, shower, don clean clothing, and immediately betaken to the first-aid station.

4.1.2 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck, and face.

4.2 EQUIPMENT DECONTAMINATION

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending on the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSO. Two decontamination stations are planned for setup. A personnel decontamination station will be established near the contractor trailer area to allow field personnel decontamination before leaving the exclusion zone. An equipment decontamination pad will be constructed adjacent the access road and the material staging area to decontaminate equipment/trucks before they leave the site.

4.3 DISPOSAL

All liquids and disposable clothing will be treated as contaminated waste and disposed of properly.

SECTION
5.0

5.0 CONSTRUCTION

5.1 DESCRIPTION

OHM has prepared a construction schedule for the proposed removal action at the Camp Allen site. The schedule is presented as a bar Gannt Chart on Figure 4. The schedule begins with notice to proceed on March 1, 1994, and ends with the final report being submitted in late October. The schedule was developed to ensure the major removal activities would be performed from June 17 through September 2, 1994, while school is recessed. The schedule includes lead times for procuring and mobilizing the resources necessary to complete the total scope of the removal action. OHM has included time to perform test pits and submit the samples for analysis and disposal facility approval. Preapproved disposal will allow OHM to load and transport the material (soil and debris) as it is ready on the drying pad and minimizes the staging/storage time on site. The assumptions of the schedule are presented in the following section.

5.2 ASSUMPTIONS AND REQUIREMENTS

The bar Gannt schedule presented as Figure 4 is based on the following assumptions:

- The work schedule is 8 hours per day, 5 days per week.
- Separate crews are provided for operating the ground water dewatering system, the water treatment system, the soil debris removal, and the loading of the waste materials for disposal. In addition, there will be an on-site management component.
- The time frames for each activity is an experienced estimate, no effort has been spent to define crew sizes, list equipment, or maximize production rates at this time.
- Sample analysis turnaround time, excluding TCLP testing, is assumed at 48 hours. OHM may opt to get 24-hour turnaround time to maintain or increase production.
- Waste materials will be loaded out as they are available on the drying pad. OHM will have disposal facility preapproval.
- OHM has sufficient lead time to install and tune the dewatering system and to have the area dewatered prior to excavation.
- All permits, site approvals, and disposal approval are obtained by start of excavation, June 17, 1994.

TABLES

TABLE

TABLE 2-1

MANPOWER REQUIREMENTS

Activity	*Equipment*	*Crew*	*Subcontractor*
Site Preparation	Bulldozer Compactor Elec. control	2 operators 1 electrician 2 RTs	
Decontamination Pad/Drying Pad		2 RTs	Asphalt crew
Dewatering System	225 Hydraulic Excavator	Install 1 operator 3 RTs Operations 3 RTs	
Water Treatment System	225 Hydraulic Excavator	Install 5 RTs 1 operator Operations 3 RTs	
Survey			Surveyor
Excavation/Drum Removal/Debris Cleaning	225 Excavator Forklift 2 Trucks Screen Loader - screen Loader - trucks Steam cleaner/ Water laser	5 operators 3 RTs 1 sample tech	Laboratory
Backfill	2 Trucks Bulldozer	3 operators 1 sample tech	Excavate and haul backfill material
Demobilization: Dewatering System Decontaminate Equipment Remove pads Remove water treatment system	225 Excavator	1 operator 4 RTs 1 electrician	Vegetation

TABLE 2-1
(CONTINUED)

Activity	*Equipment*	*Crew*	*Subcontractor*
Administration and Support		PCT Supervisor Foreman Project engineer QC engineer Project manager	

FIGURES

FIGURES

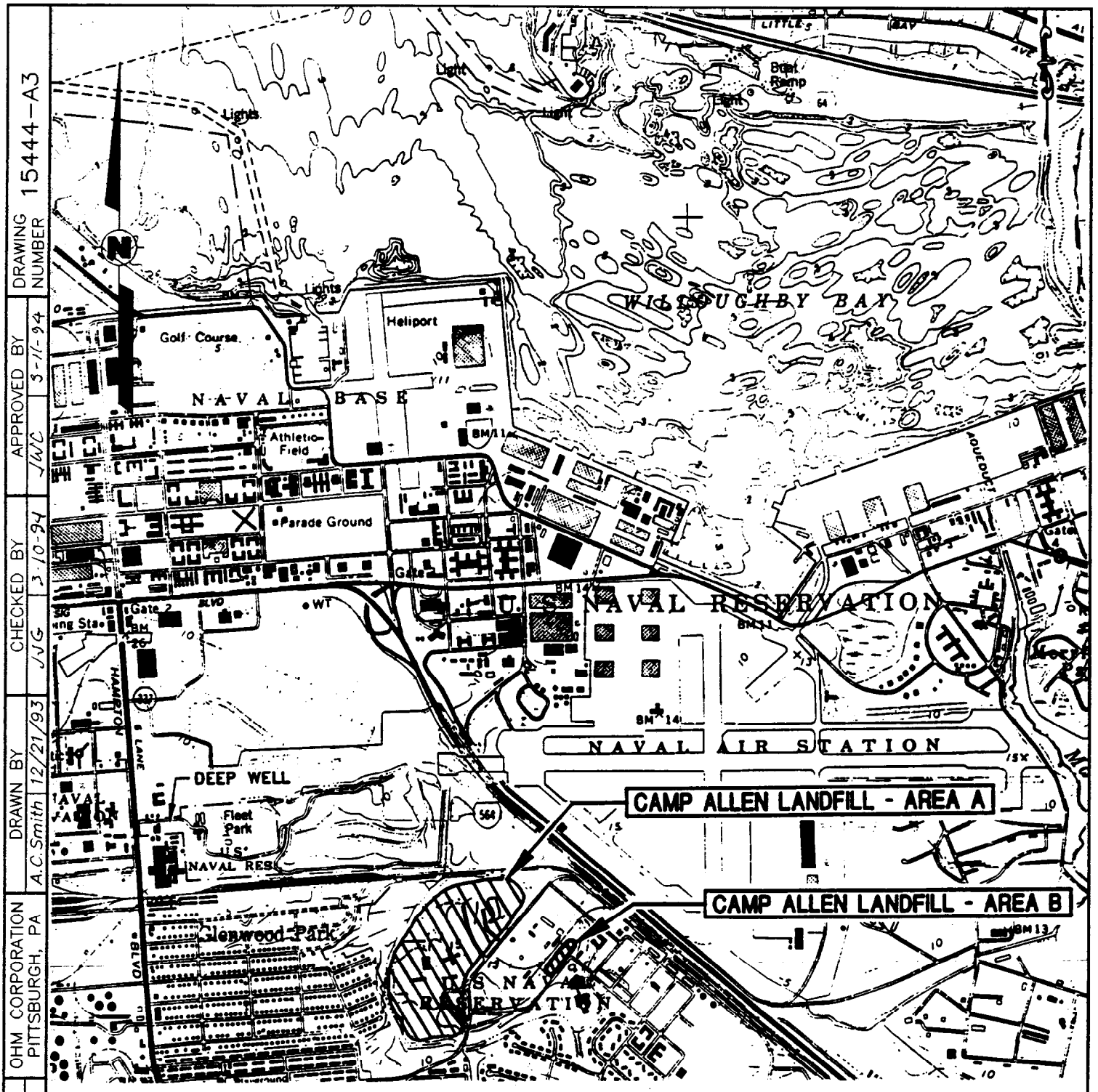


FIGURE 1

SITE LOCATION MAP
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

SCALE
0 2000 4000 FEET

REFERENCE:
U.S.G.S 7.5 MIN TOPOGRAPHIC MAP,
NORFOLK NORTH QUADRANGLE, VA
DATED: 1965 (PHOTOREVISED 1986)

OHM Corporation

OHM CORPORATION
PITTSBURGH, PA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
A.C. Smith 12/21/93	JJG 3-10-94	JWC 3-11-94	15444-A3

PLOT SCALE: 1" = 1"

OHM CORPORATION PITTSBURGH, PA	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	M. WARNICK 12/28/93	JJG 3-11-94	JWC 5-11-94	15444-A4

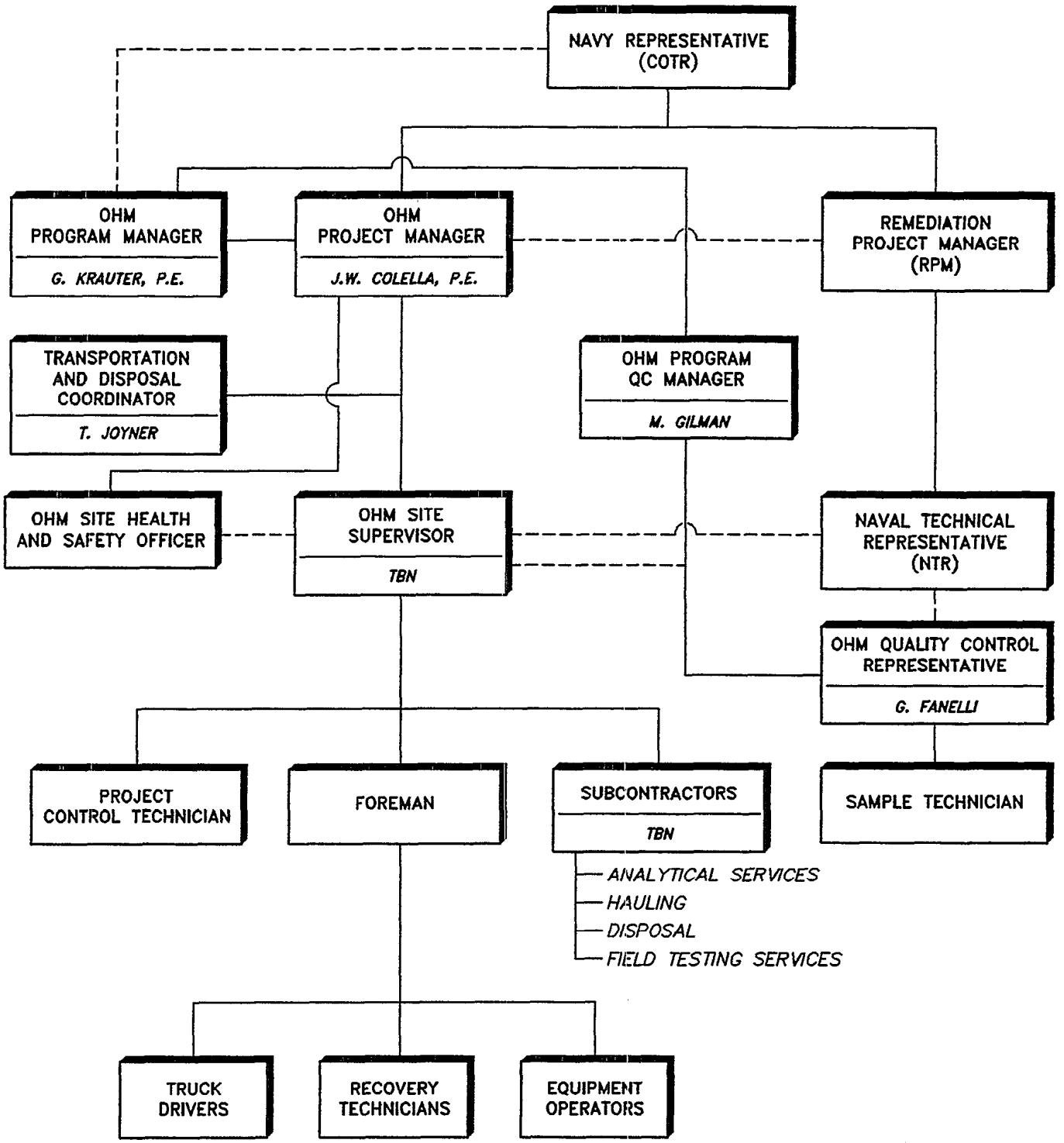


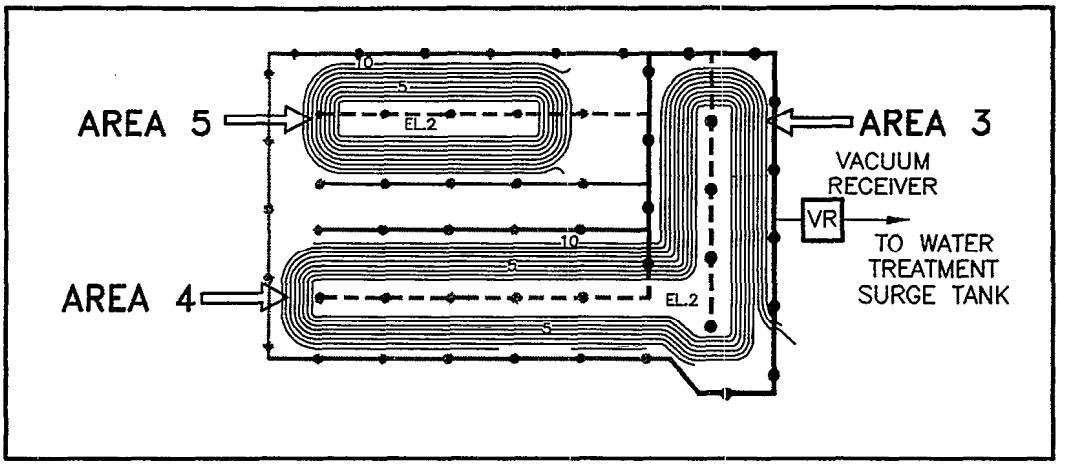
FIGURE 2

PROJECT ORGANIZATION CHART
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA

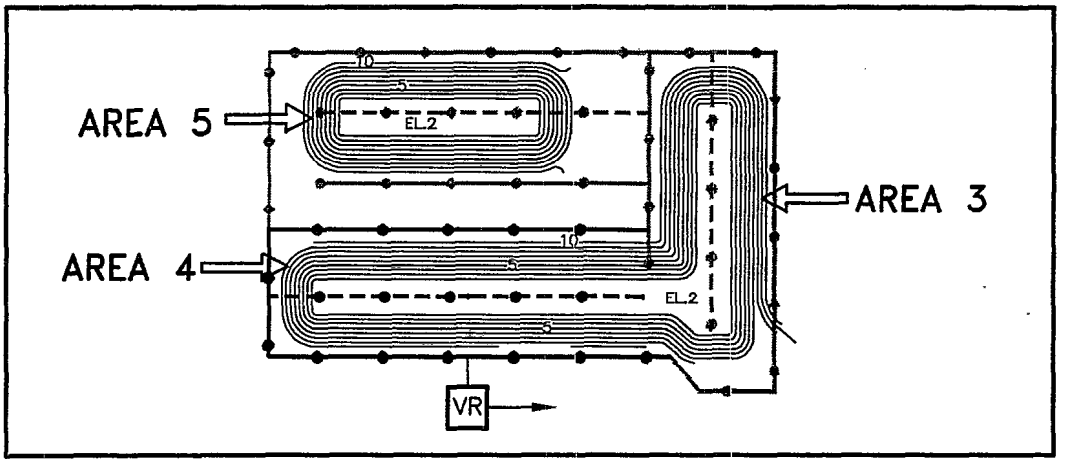
PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

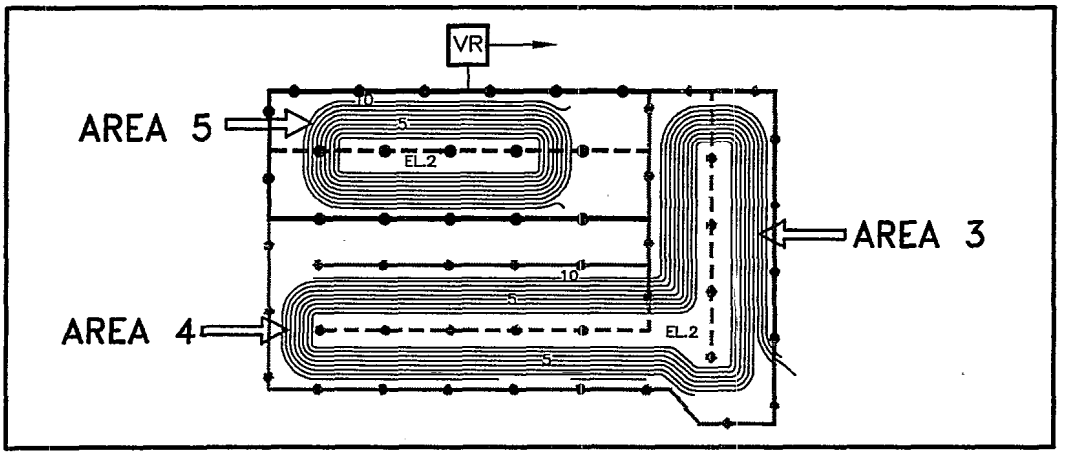
OHM Corporation



PHASE 1



PHASE 2



PHASE 3

LEGEND:

- MANIFOLD PIPE AND WELL LOCATIONS.
- MANIFOLD PIPE AND WELL LOCATIONS TO BE REMOVED PRIOR TO EXCAVATION

NOTES:

1. WELL SPACING = 5 FEET.
2. ALL WELL POINTS TO BE INSTALLED. SYSTEM WILL BE ADJUSTED TO WITHDRAW WATER WHEN AND AS REQUIRED.

"THIS DRAWING NOT TO SCALE"

FIGURE 3

OPERATIONAL SEQUENCING
WELL-POINT DEWATERING PLAN
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

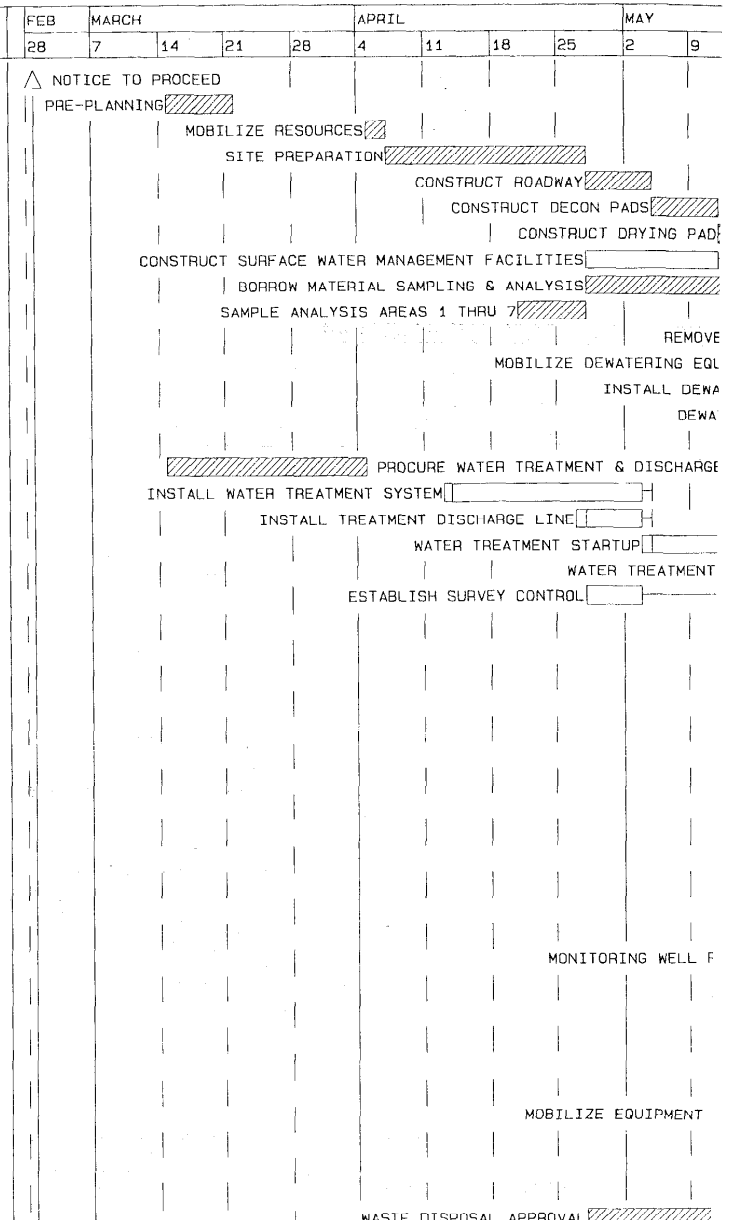
OHM Corporation

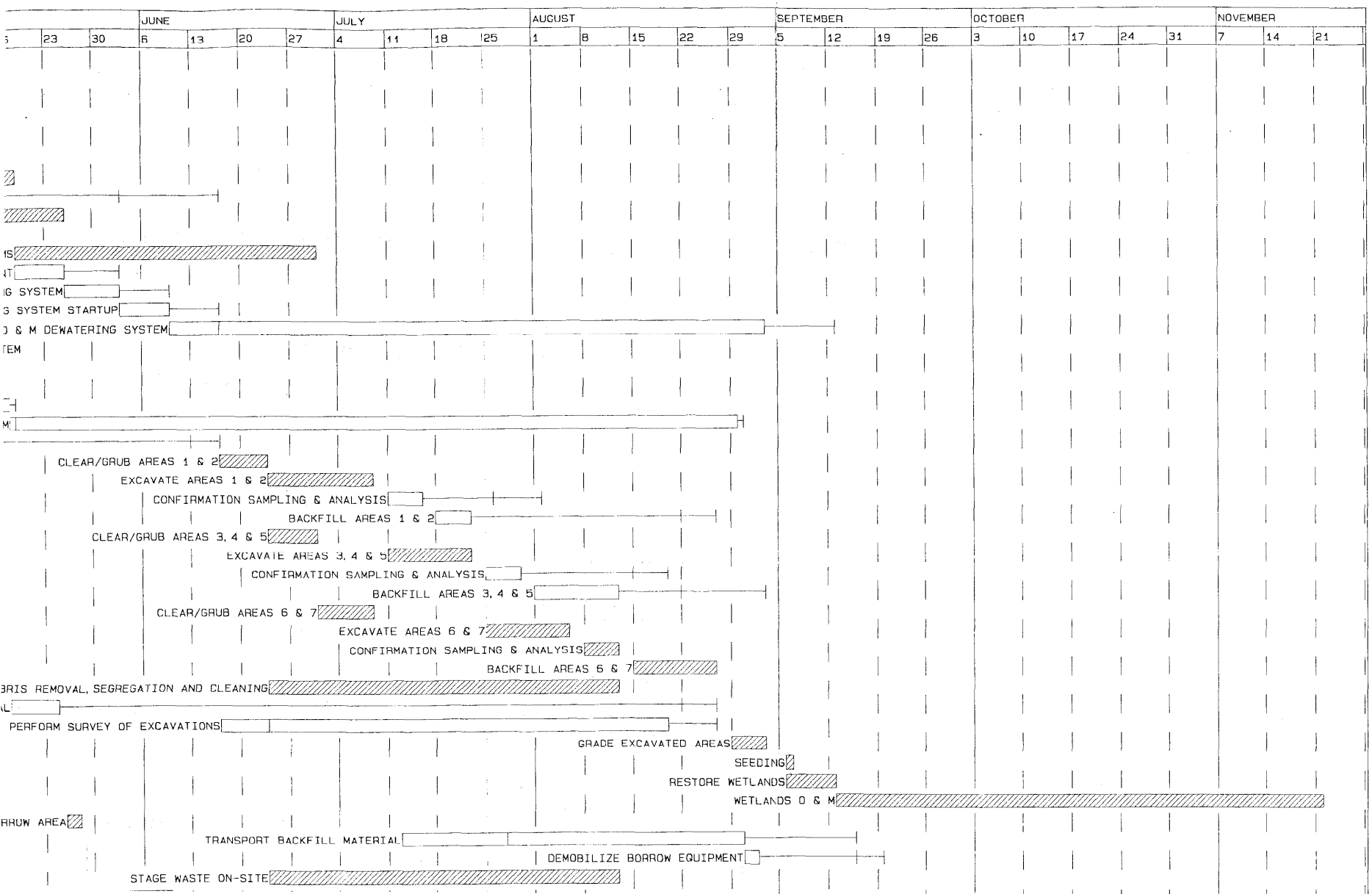
OHM CORPORATION PITTSBURGH, PA	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
	A.C.Smith 12/21/93	JJG 3-11-94	JWC 3-11-94	15444-A6

PLOT SCALE: 1" = 1'

DRAWING NUMBER	15444-D11
APPROVED BY	JWC 3-11-94
CHECKED BY	JJG 3-11-94
/94	

ACTIVITY NUMBER	DESCRIPTION	REM DUR	PCT CMP	AVERAGE START	AVERAGE FINISH	DUR/ TOT FLT
1000	NOTICE TO PROCEED	0	0	01MAR94	28FEB94	0/0
1030	PRE-PLANNING	5	0	15MAR94	21MAR94	5/0
1100	MOBILIZE RESOURCES	2	0	05APR94	06APR94	2/0
1110	SITE PREPARATION	15	0	07APR94	27APR94	15/0
1120	CONSTRUCT ROADWAY	5	0	28APR94	04MAY94	5/0
1130	CONSTRUCT DECON PADS	5	0	05MAY94	11MAY94	5/0
1140	CONSTRUCT DRYING PAD	5	0	12MAY94	18MAY94	5/0
1150	CONSTRUCT SURFACE WATER MANAGEMENT FACILITIES	10	0	16MAY94	27MAY94	10/25
1160	BORROW MATERIAL SAMPLING & ANALYSIS	20	0	28APR94	25MAY94	20/0
1170	SAMPLE ANALYSIS AREAS 1 THRU 7	5	0	21APR94	27APR94	5/0
1200	REMOVE DRUMS	30	0	19MAY94	30JUN94	30/0
1300	MOBILIZE DEWATERING EQUIPMENT	5	0	23MAY94	27MAY94	5/5
1310	INSTALL DEWATERING SYSTEM	5	0	31MAY94	06JUN94	5/5
1320	DEWATERING SYSTEM STARTUP	5	0	07JUN94	13JUN94	5/5
1330	O & M DEWATERING SYSTEM	60	0	14JUN94	07SEP94	60/5
1400	PROCURE WATER TREATMENT & DISCHARGE SYSTEM	15	0	15MAR94	04APR94	15/0
1410	INSTALL WATER TREATMENT SYSTEM	15	0	13APR94	03MAY94	15/1
1420	INSTALL TREATMENT DISCHARGE LINE	5	0	27APR94	03MAY94	5/1
1430	WATER TREATMENT STARTUP	10	0	04MAY94	17MAY94	10/1
1440	WATER TREATMENT O & M	72	0	18MAY94	29AUG94	72/1
1450	ESTABLISH SURVEY CONTROL	4	0	19MAY94	24MAY94	4/31
1500	CLEAR/GRUB AREAS 1 & 2	5	0	17JUN94	23JUN94	5/0
1510	EXCAVATE AREAS 1 & 2	10	0	24JUN94	08JUL94	10/0
1520	CONFIRMATION SAMPLING & ANALYSIS	5	0	18JUL94	22JUL94	5/11
1530	BACKFILL AREAS 1 & 2	5	0	03AUG94	09AUG94	5/25
1540	CLEAR/GRUB AREAS 3, 4 & 5	5	0	24JUN94	30JUN94	5/0
1550	EXCAVATE AREAS 3, 4 & 5	10	0	11JUL94	22JUL94	10/0
1560	CONFIRMATION SAMPLING & ANALYSIS	5	0	03AUG94	09AUG94	5/15
1570	BACKFILL AREAS 3, 4 & 5	10	0	10AUG94	23AUG94	10/15
1600	CLEAR/GRUB AREAS 6 & 7	5	0	01JUL94	08JUL94	5/0
1610	EXCAVATE AREAS 6 & 7	10	0	25JUL94	05AUG94	10/0
1620	CONFIRMATION SAMPLING & ANALYSIS	5	0	08AUG94	12AUG94	5/0
1630	BACKFILL AREAS 6 & 7	10	0	15AUG94	26AUG94	10/0
1650	DEBRIS REMOVAL, SEGREGATION AND CLEANING	35	0	24JUN94	12AUG94	35/0
1660	MONITORING WELL REMOVAL	5	0	06JUL94	12JUL94	5/66
1670	PERFORM SURVEY OF EXCAVATIONS	45	0	21JUN94	23AUG94	45/5
1700	GRADE EXCAVATED AREAS	5	0	29AUG94	02SEP94	5/0
1710	SEEDING	1	0	06SEP94	06SEP94	1/0
1720	RESTORE WETLANDS	5	0	06SEP94	12SEP94	5/0
1730	WETLANDS O & M	50	0	13SEP94	21NOV94	50/0
1750	MOBILIZE EQUIPMENT TO BORROW AREA	2	0	20MAY94	27MAY94	2/0
1760	TRANSPORT BACKFILL MATERIAL	35	0	20JUL94	07SEP94	35/11
1780	DEMOBILIZE BORROW EQUIPMENT	2	0	08SEP94	09SEP94	2/11
1820	STAGE WASTE ON-SITE	35	0	24JUN94	12AUG94	35/0
		30	0	28APR94	09JUN94	30/0




JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
23
30
6
13
20
27
4
11
18
25
1
8
15
22
29
5
12
19
26
3
10
17
24
31
7
14
21
IS
IT
IG SYSTEM
G SYSTEM STARTUP
) & M DEWATERING SYSTEM
TEM
M
CLEAR/GRUB AREAS 1 & 2
EXCAVATE AREAS 1 & 2
CONFIRMATION SAMPLING & ANALYSIS
BACKFILL AREAS 1 & 2
CLEAR/GRUB AREAS 3, 4 & 5
EXCAVATE AREAS 3, 4 & 5
CONFIRMATION SAMPLING & ANALYSIS
BACKFILL AREAS 3, 4 & 5
CLEAR/GRUB AREAS 6 & 7
EXCAVATE AREAS 6 & 7
CONFIRMATION SAMPLING & ANALYSIS
BACKFILL AREAS 6 & 7
BRIS REMOVAL, SEGREGATION AND CLEANING
L
PERFORM SURVEY OF EXCAVATIONS
GRADE EXCAVATED AREAS
SEEDING
RESTORE WETLANDS
WETLANDS O & M
RROW AREA
TRANSPORT BACKFILL MATERIAL
DEMOBILIZE BORROW EQUIPMENT
STAGE WASTE ON-SITE

1850	TRANSPORT AND DISPOSAL OF WASTES	35	0	24JUN94	12AUG94	35/0
1950	DEMOBILIZE RESOURCES	2	0	20SEP94	21SEP94	2/0
1960	REMOVE DEWATERING SYSTEM	4	0	29AUG94	01SEP94	4/1
1970	DECONTAMINATE SITE EQUIPMENT	2	0	06SEP94	07SEP94	2/0
1980	REMOVE WATER TREATMENT SYS	4	0	08SEP94	13SEP94	4/0
1990	SITE CLEANUP	4	0	14SEP94	19SEP94	4/0
1995	ADMINISTRATIVE & SUPPORT	115	0	07APR94	19SEP94	115/0
2100	PREPARE FINAL REPORT	24	0	04OCT94	04NOV94	24/0

ADMINISTRATIVE & SUPPORT

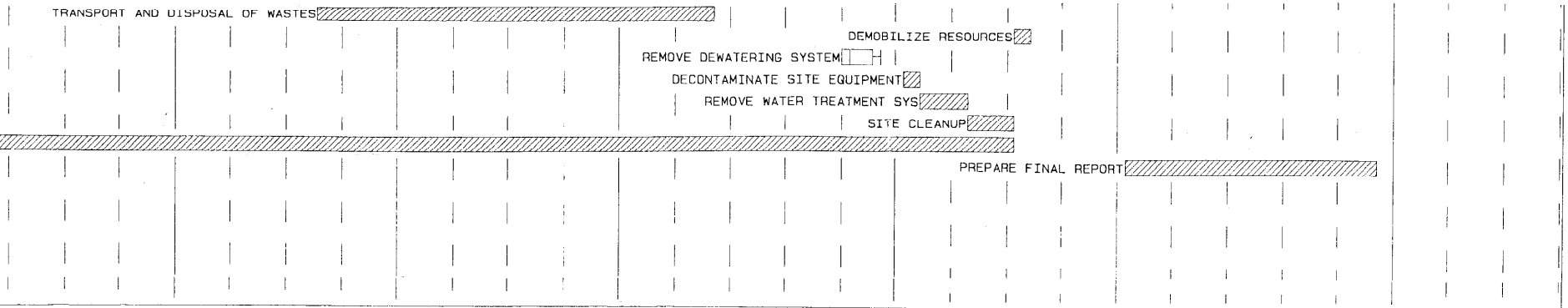
LS FLOAT
DESC
MILESTONE
CRITICAL
PROGRESS
PLANNED

OHM PROJ. NO. 15444-L
LANTDIV PROJECT OFFICER -
OHM PROJECT MANAGER - JCS

OHM CORPORATION
PITTSBURGH, PA

DRAWN BY A.C.Smith 3/1

PLOT SCALE: 1" = 1"



AN-004
KEN WALKER
PH COLELLA

RUN DATE	21DEC93	LANTDIV DO 0003
START DATE	01MAR94	CAMP ALLEN AREA B LANDFILL
DATA DATE	01MAR94	SOIL AND DEBRIS REMOVAL ACTION
FINISH DATE	21NOV94	CONSTRUCTION SCHEDULE
SURETRAK		CAMP ALLEN AREA B SOIL REMOVAL

FIGURE 4

BAR CHART CONSTRUCTION SCHEDULE
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA

PREPARED FOR

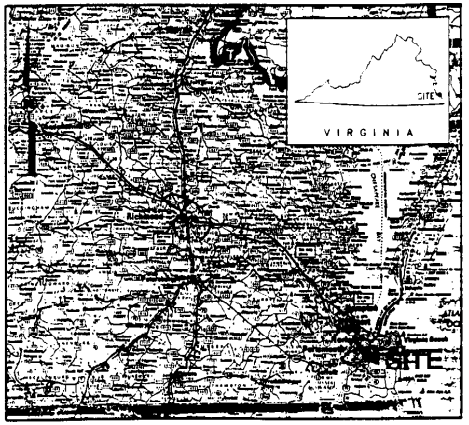
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

OHM Corporation

APPENDIX
A

APPENDIX A

DRAWINGS



SITE VICINITY MAP

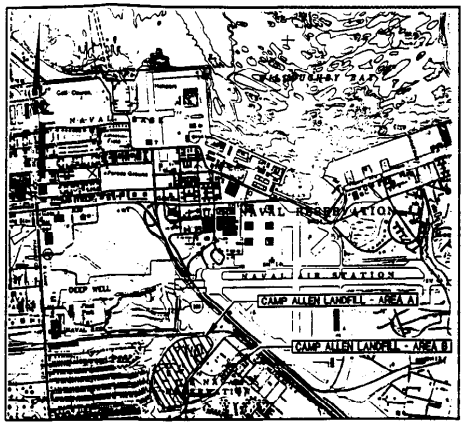
SCALE
5 0 5 10 MILES

INDEX OF DRAWINGS

OHM DRAWING NUMBER	SHEET REFERENCE NUMBER	DESCRIPTION
15444-T1	RA-0	TITLE SHEET
15444-D1	RA-1	SITE OPERATIONAL PLAN
15444-D5	RA-2	PROPOSED EXCAVATION LIMITS
15444-D6	RA-3	PROPOSED FINAL GRADING PLAN
15444-D8	RA-4	DRYING PAD-PLAN, SECTIONS AND DETAILS
15444-D7	RA-5	DECONTAMINATION PAD-PLANS, SECTIONS, AND DETAILS
15444-D9	RA-6	MISCELLANEOUS DETAILS
15444-D10	RA-7	PROCESS AND INSTRUMENTATION DIAGRAM

NOTE:

USE THESE DRAWINGS WITH USE PLAN, HEALTH AND SAFETY PLAN, ENVIRONMENTAL PROTECTION PLAN, AND CONTRACTOR'S SAMPLING AND ANALYSIS PLAN FOR THIS PROJECT.

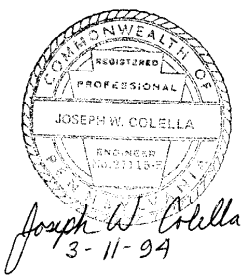


SITE LOCATION MAP

SCALE
0 2000 4000 FEET

SOIL AND DEBRIS REMOVAL ACTION

CAMP ALLEN LANDFILL, AREA B
NAVAL BASE, NORFOLK, VIRGINIA



PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation

A/E CONTRACT NO. N62470-93-D-3032

ACTIVITY - SATISFACTION OF

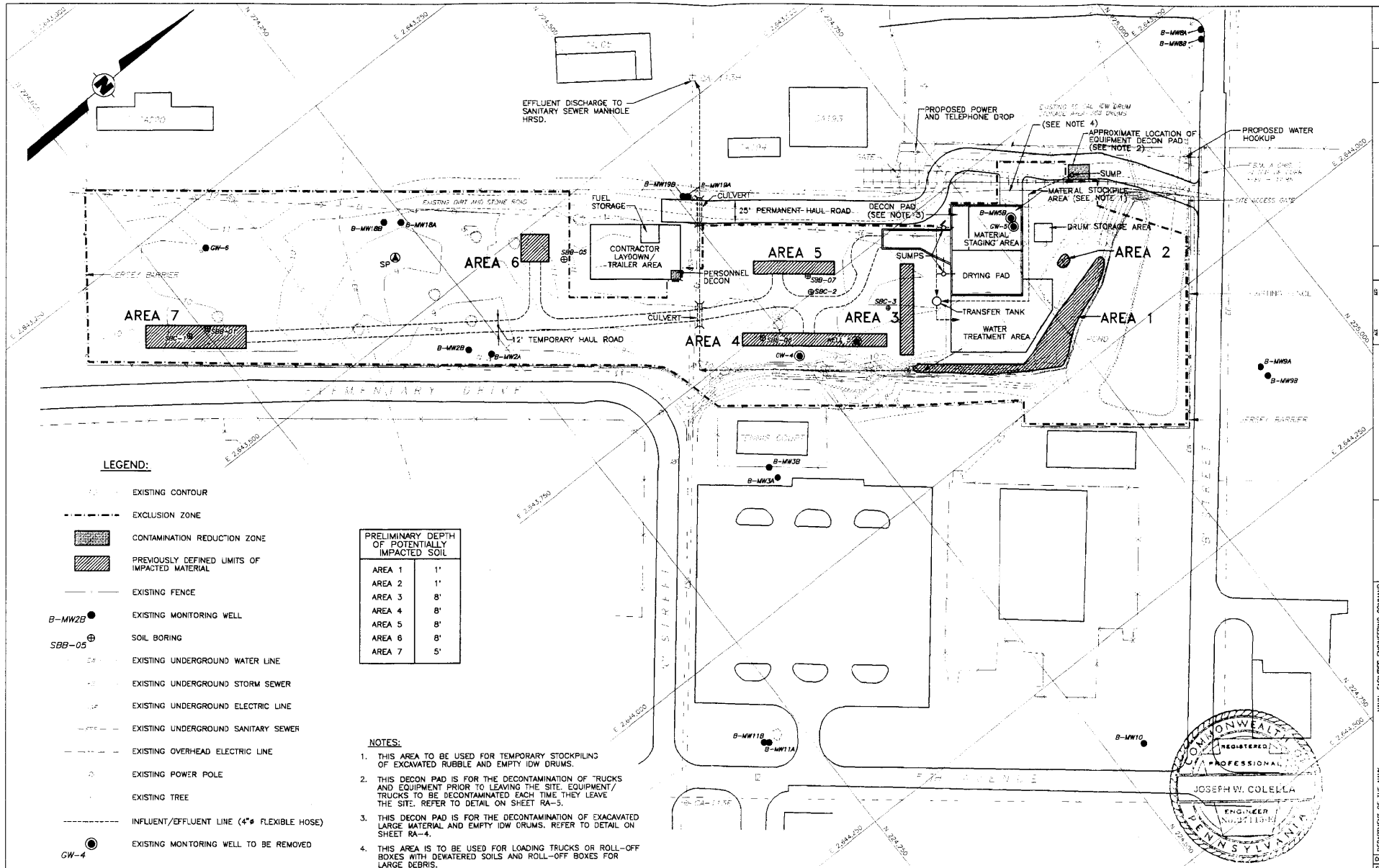
FOR USE FOR CONTRACTOR NAVFAC

DESIGNED
DRAWN
CHECKED
PROJECT MANAGER
FIELD SUPERVISOR
HEALTH & SAFETY
QUALITY CONTROL
BRANCH MANAGER

DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
NAVAL BASE, NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL AREA B
SOIL AND DEBRIS REMOVAL ACTION
TITLE SHEET

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
EFD NO.
SIA PROJECT NO.
SPEC NO.
CONSTR. CONTRACT NO. N62470-93-D-3032
NAVFAC DRAWING NO.
SHEET OF
RA-0



LEGEND:

- EXISTING CONTOUR
- EXCLUSION ZONE
- CONTAMINATION REDUCTION ZONE
- PREVIOUSLY DEFINED LIMITS OF IMPACTED MATERIAL
- EXISTING FENCE
- B-MW2B — EXISTING MONITORING WELL
- SBB-05 — SOIL BORING
- EXISTING UNDERGROUND WATER LINE
- EXISTING UNDERGROUND STORM SEWER
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND SANITARY SEWER
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING POWER POLE
- EXISTING TREE
- INFLUENT/EFFLUENT LINE (4"ø FLEXIBLE HOSE)
- GW-4 — EXISTING MONITORING WELL TO BE REMOVED

PRELIMINARY DEPTH OF POTENTIALLY IMPACTED SOIL	
AREA 1	1'
AREA 2	1'
AREA 3	8'
AREA 4	8'
AREA 5	8'
AREA 6	8'
AREA 7	5'

NOTES:

1. THIS AREA TO BE USED FOR TEMPORARY STOCKPILING OF EXCAVATED RUBBLE AND EMPTY IDW DRUMS.
2. THIS DECON PAD IS FOR THE DECONTAMINATION OF TRUCKS AND EQUIPMENT PRIOR TO LEAVING THE SITE. EQUIPMENT/ TRUCKS TO BE DECONTAMINATED EACH TIME THEY LEAVE THE SITE. REFER TO DETAIL ON SHEET RA-5.
3. THIS DECON PAD IS FOR THE DECONTAMINATION OF EXACAVATED LARGE MATERIAL AND EMPTY IDW DRUMS. REFER TO DETAIL ON SHEET RA-4.
4. THIS AREA IS TO BE USED FOR LOADING TRUCKS OR ROLL-OFF BOXES WITH DEWATERED SOILS AND ROLL-OFF BOXES FOR LARGE DEBRIS.
5. TOPOGRAPHY AND EXCAVATION AREA LOCATIONS WERE PROVIDED BY BAKER ENVIRONMENTAL, INC. DRAFT FINAL REMEDIAL INVESTIGATION REPORT, CAMP ALLEN LANDFILL, NORFOLK NAVAL BASE.
6. FOR WATER TREATMENT PLANT PROCESS FLOW, SEE SHEET RA-7.
7. THE WATER TREATMENT PAD WILL CONSIST OF 6 INCH LAYER OF CRUSHED STONE.

REFERENCE:

TOPOGRAPHY AND EXCAVATION AREA LOCATIONS WERE TAKEN FROM "REMEDIAL INVESTIGATION REPORT, CAMP ALLEN LANDFILL, NORFOLK NAVAL BASE" PREPARED BY BAKER YOUNG INC., 1992.

SCALE
50 0 50 100 FEET

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER
No. 27113-E

REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED BY

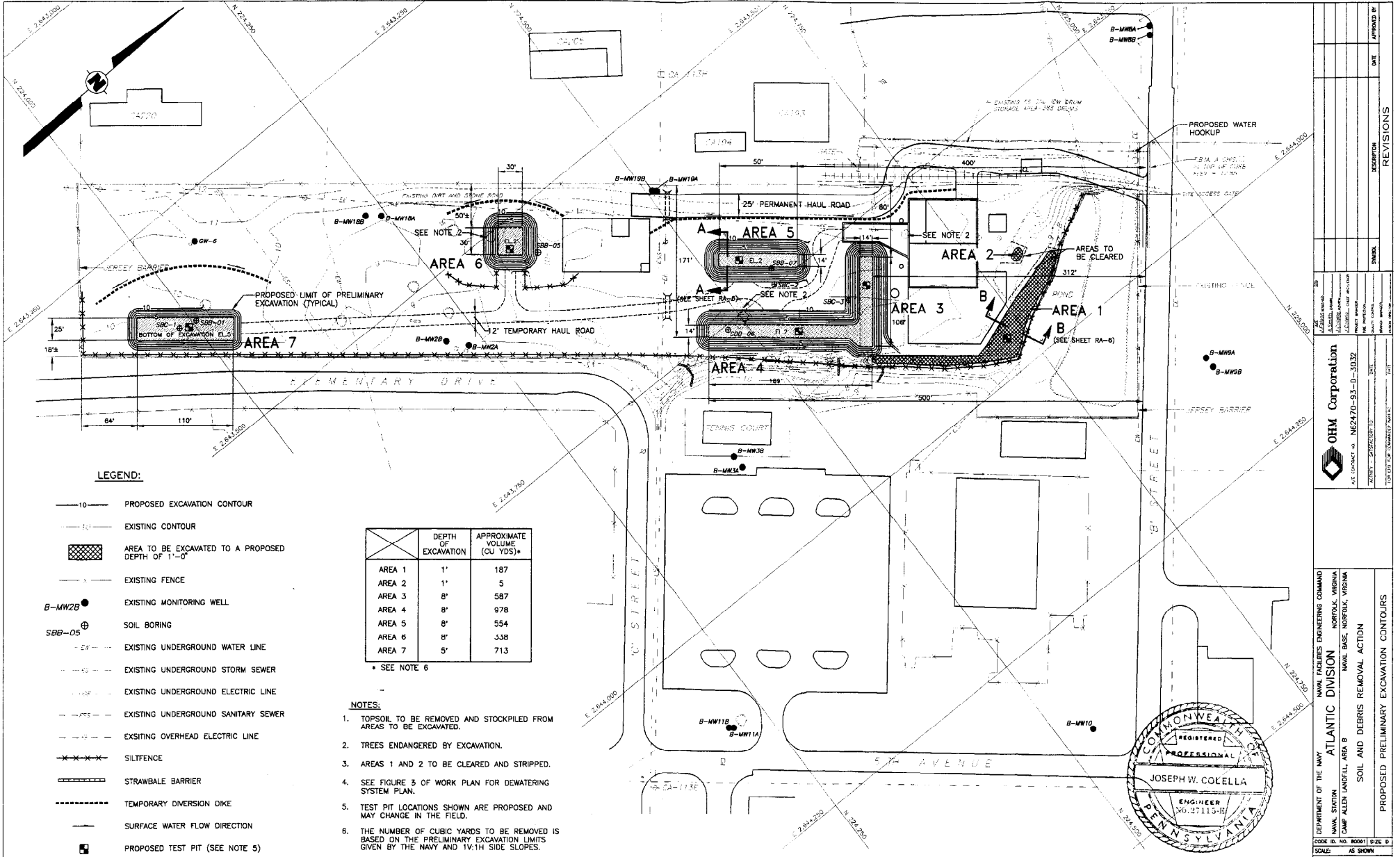
OHM Corporation
A/E CONTRACT NO. N62470-93-D-3032

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B NAVAL BASE, NORFOLK, VIRGINIA

SOIL AND DEBRIS REMOVAL ACTION

SITE OPERATIONAL PLAN

CODE ID. NO.	80091
SIZE	D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC NO.	
CONSTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	
SHEET	RA-1
OF	



LEGEND:

- PROPOSED EXCAVATION CONTOUR
- EXISTING CONTOUR
- AREA TO BE EXCAVATED TO A PROPOSED DEPTH OF 1'-0"
- EXISTING FENCE
- B-MW2B — EXISTING MONITORING WELL
- SBB-05 — SOIL BORING
- EXISTING UNDERGROUND WATER LINE
- EXISTING UNDERGROUND STORM SEWER
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND SANITARY SEWER
- EXSITING OVERHEAD ELECTRIC LINE
- SILTFENCE
- STRAWBALE BARRIER
- TEMPORARY DIVERSION DIKE
- SURFACE WATER FLOW DIRECTION
- PROPOSED TEST PIT (SEE NOTE 5)

	DEPTH OF EXCAVATION	APPROXIMATE VOLUME (CU YDS)*
AREA 1	1'	187
AREA 2	1'	5
AREA 3	8'	587
AREA 4	8'	978
AREA 5	8'	554
AREA 6	8'	338
AREA 7	5'	713

* SEE NOTE 6

NOTES:

1. TOPSOIL TO BE REMOVED AND STOCKPILED FROM AREAS TO BE EXCAVATED.
2. TREES ENDANGERED BY EXCAVATION.
3. AREAS 1 AND 2 TO BE CLEARED AND STRIPPED.
4. SEE FIGURE 3 OF WORK PLAN FOR DEWATERING SYSTEM PLAN.
5. TEST PIT LOCATIONS SHOWN ARE PROPOSED AND MAY CHANGE IN THE FIELD.
6. THE NUMBER OF CUBIC YARDS TO BE REMOVED IS BASED ON THE PRELIMINARY EXCAVATION LIMITS GIVEN BY THE NAVY AND 1V:1H SIDE SLOPES.
7. WHERE THE EXCAVATION VOLUME IS LESS THAN 500 CUBIC YARDS, ONE TEST PIT WILL BE CONSTRUCTED IN ORDER TO REPRESENT MATERIAL TO BE REMOVED.

REFERENCE:
TOPOGRAPHY AND EXCAVATION AREA LOCATIONS WERE TAKEN FROM "REMEDIAL INVESTIGATION REPORT, CAMP ALLEN LANDFILL, NORFOLK NAVAL BASE" PREPARED BY BAKER YOUNG INC., 1992.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED BY

OHM Corporation
A/E CONTRACT NO. N62470-93-D-3032

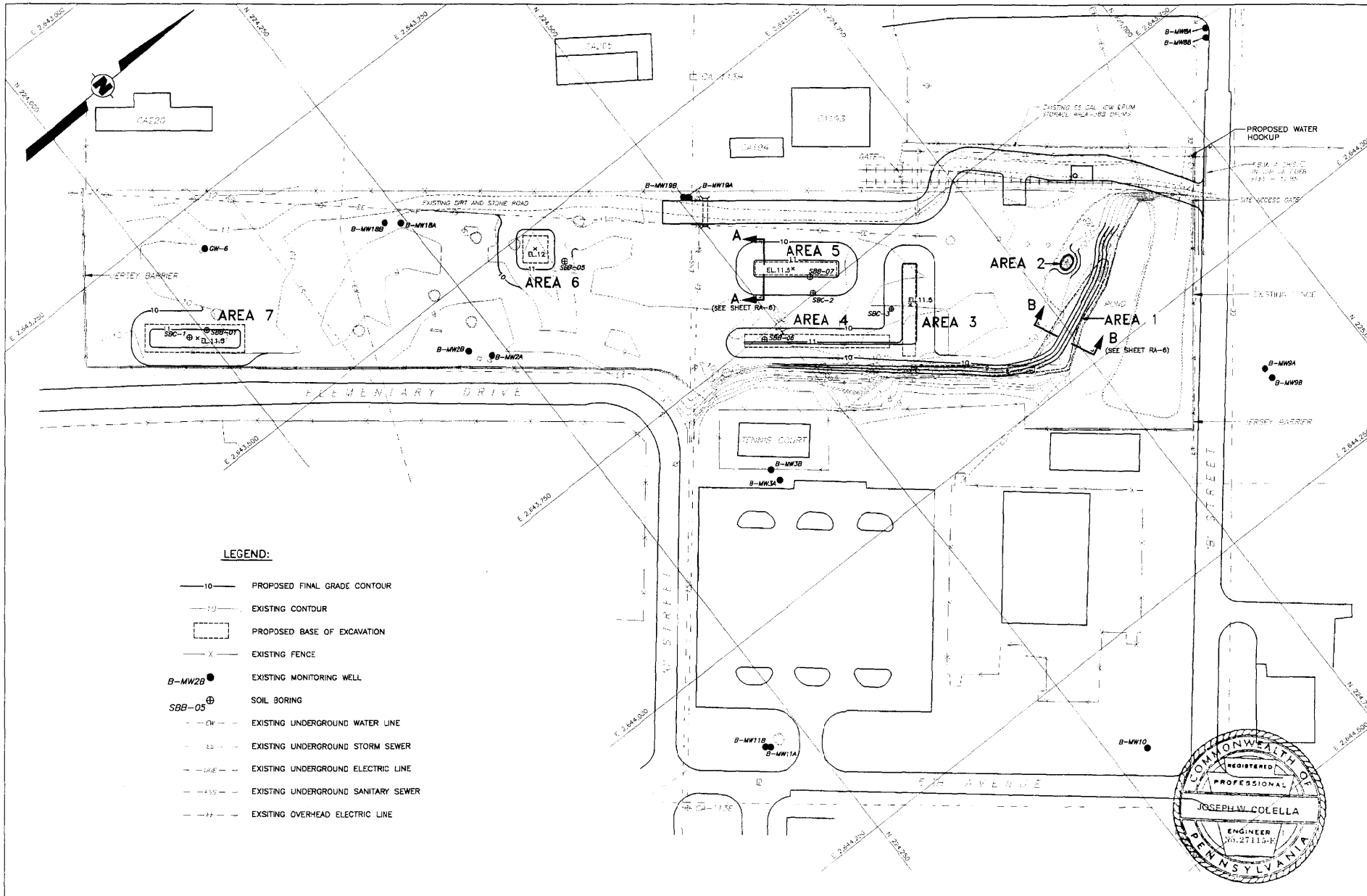
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION: ATLANTIC DIVISION NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B NAVAL BASE, NORFOLK, VIRGINIA
SOIL AND DEBRIS REMOVAL ACTION

PROPOSED PRELIMINARY EXCAVATION CONTOURS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER
No. 27115-E

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC NO.	
CONSTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	
SHEET	OF

RA-2



REFERENCE:

TOPOGRAPHY AND EXCAVATION AREA LOCATIONS WERE TAKEN FROM "REMEDIAL INVESTIGATION REPORT, CAMP ALLEN LANDFILL, NORFOLK NAVAL BASE" PREPARED BY BAKER YOUNG INC., 1992.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER
No. 27115-E

REVISIONS

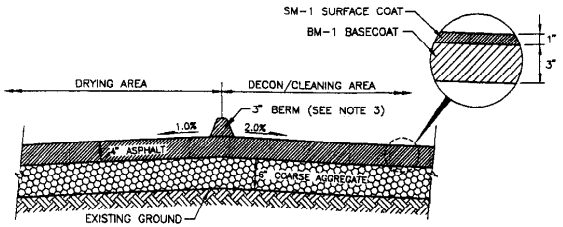
SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation
A/E CONTRACT NO. N62470-93-D-3032

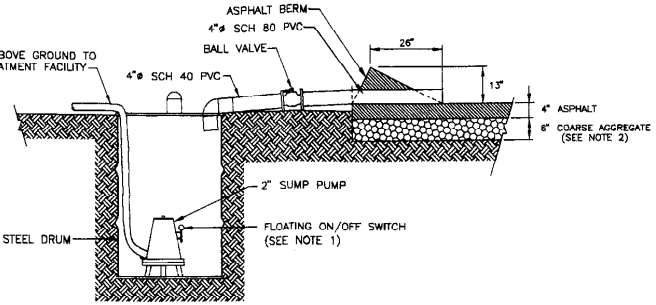
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
NAVAL BASE, NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL AREA B
SOIL AND DEBRIS REMOVAL ACTION
PROPOSED FINAL GRADING PLAN

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC NO.	
CONSTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	
SHEET	OF

RA-3



SECTION (A)
N. T. S.



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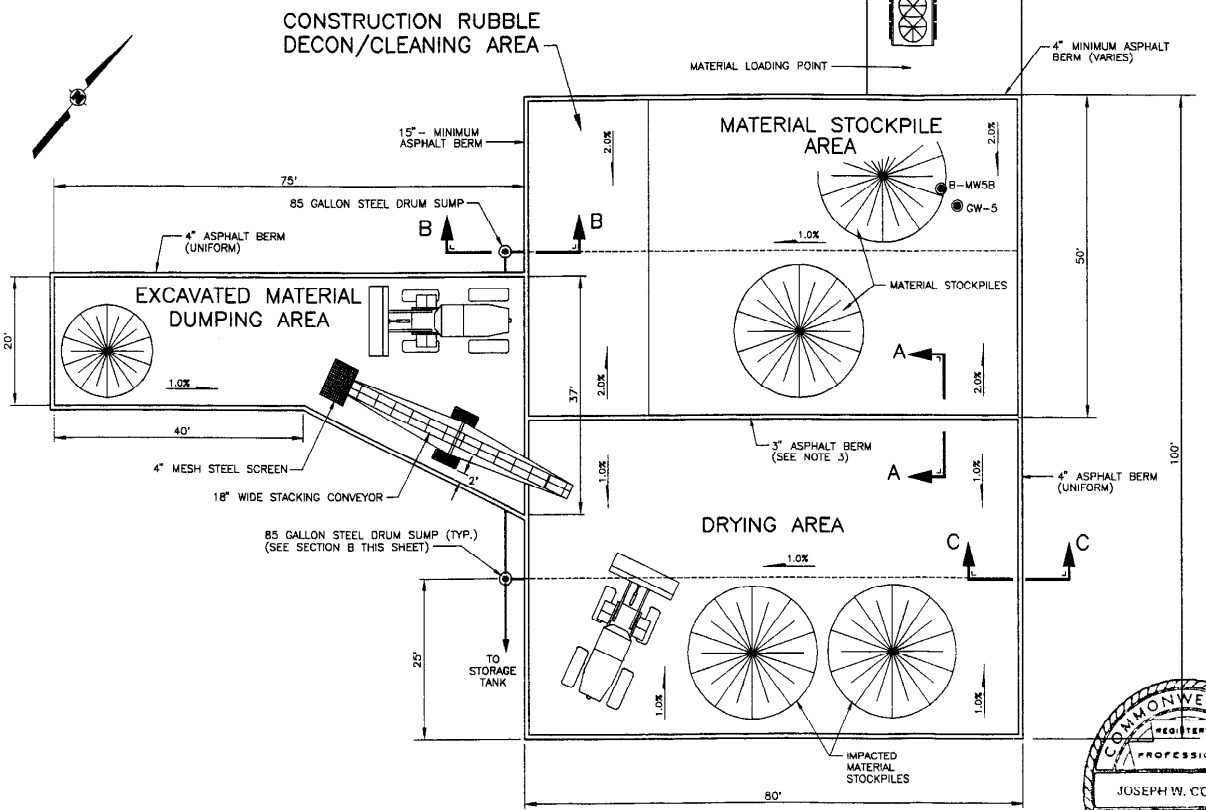
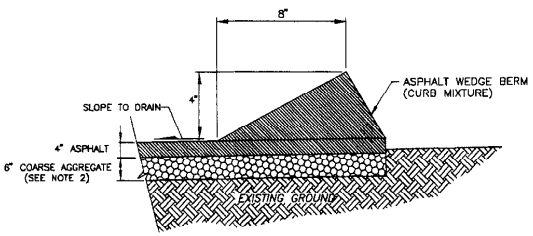
N. T. S.

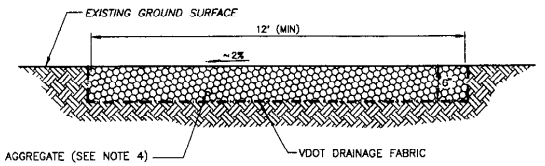


PLAN-DRYING/DECONTAMINATION PAD

SCALE
10 0 10 20 FEET



SECTION (C)
N. T. S.



TYPICAL TEMPORARY CONSTRUCTION ENTRANCE SECTION

N. T. S.

NOTES:

1. ON/OFF OPERATION OF PUMP IS CONTROLLED BY FLOAT SO THAT PUMP STARTS WHEN SUMP WATER LEVEL REACHES 4" BELOW SUMP INLET AND SHUTS OFF WHEN WATER LEVEL DROPS TO PUMP DISCHARGE LEVEL.
2. THE 6-INCH THICKNESS OF THE COARSE AGGREGATE SUBBASE SHOWN MAY BE MODIFIED IN THE FIELD TO 8 INCHES DEPENDING ON THE FIRMNESS OF THE NATURAL SUBGRADE.
3. THE DRYING AREA IS DESIGNED FOR WATER CONTAINMENT DURING A 10 YEAR STORM EVENT, AND IS SEPARATED FROM THE DECONTAMINATION AREA BY A 3" BERM.
4. VDOT #57 AGGREGATE WILL BE USED FOR ENTRANCE ROAD AND WATER TREATMENT PAD CONSTRUCTION. VDOT #3 AGGREGATE WILL BE USED FOR ACCESS ROAD CONSTRUCTION.
5. MONITORING WELLS B-MW5B AND GW-5 TO BE REMOVED PRIOR TO CONSTRUCTION OF DRYING/DECONTAMINATION PAD.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER
No. 27133-E

REVISIONS

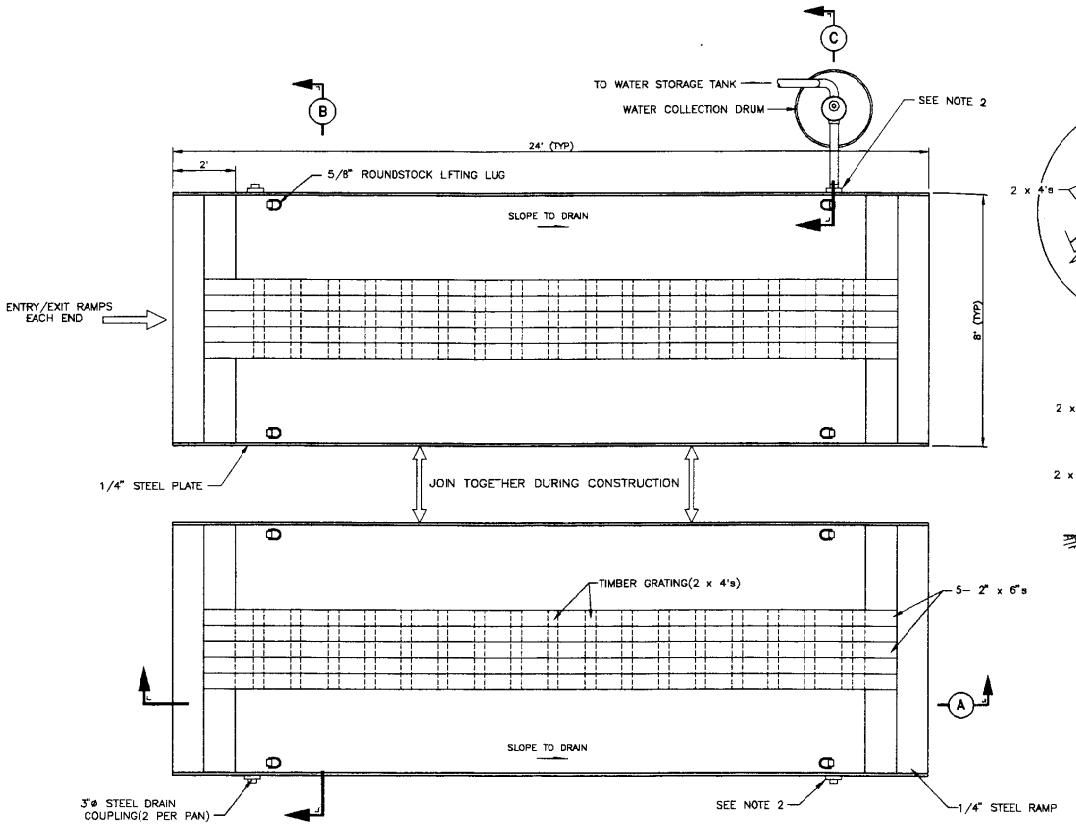
SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation
N.A.E. CONTRACT NO. N62470-93-D-3032
ACTIVITY - SATISFACTORY TO:
DATE
TOP SIGN FOR COMMANDING OFFICER, NAVFAC
DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
NAVAL BASE, NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B
SOIL AND DEBRIS REMOVAL ACTION
DRYING PAD - PLAN, SECTIONS, AND DETAILS

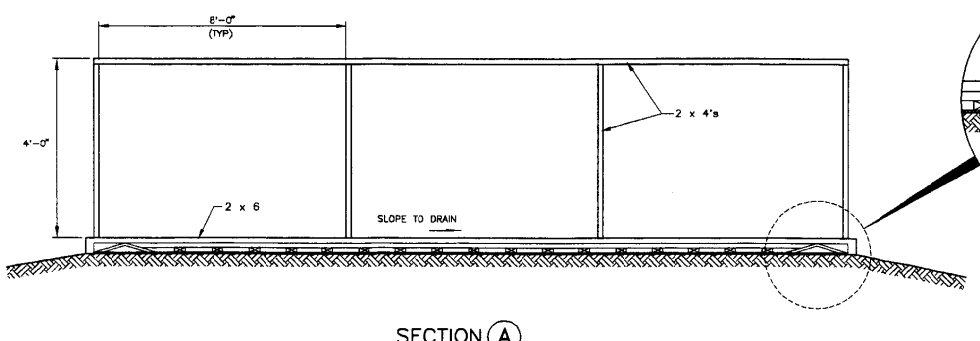
CODE ID. NO. 80061	SIZE D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC. NO.	
CONTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	NAVFAC
SHEET	OF

RA-4



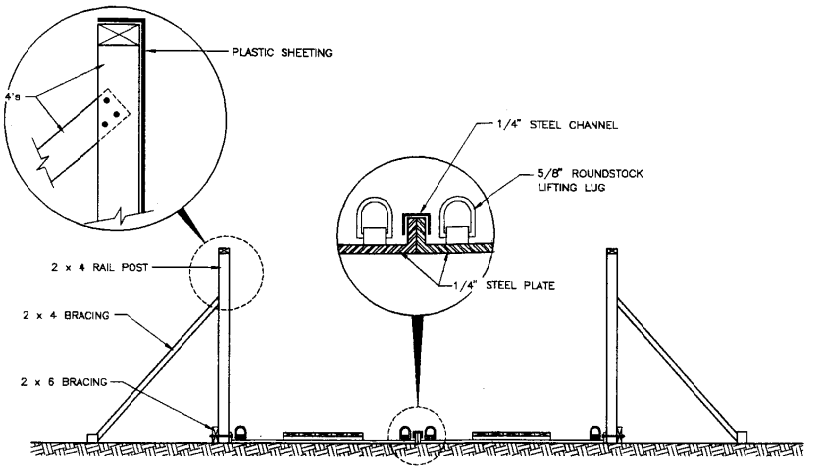
PLAN – DECONTAMINATION PAD

SCALE: 1/2" = 1'-0"



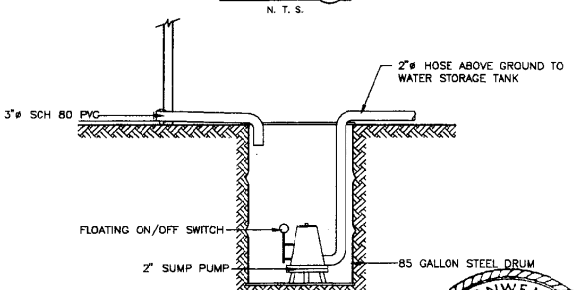
SECTION (A)

N. T. S.



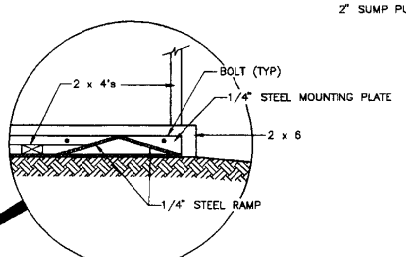
SECTION (B)

N. T. S.



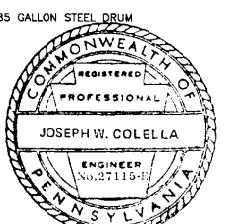
SECTION (C)

N. T. S.



NOTES:

1. ON/OFF OPERATION OF PUMP IS CONTROLLED BY FLOAT SO THAT PUMP STARTS WHEN SUMP WATER LEVEL REACHES 4" BELOW SUMP INLET AND SHUTS OFF WHEN WATER LEVEL DROPS TO PUMP DISCHARGE LEVEL.
2. DRAIN COUPLING IS TO BE FITTED WITH QUICK DISCONNECT AND 3"ø SCH 80 PVC (INNER COUPLING) OR 3"ø RUBBER DISCHARGE HOSE (OUTER COUPLING) TO SUMP. THE OUTER DRAIN COUPLING IS TO BE USED ONLY AFTER VEHICLE HAS LEFT THE PAD. PLUG ALL DRAINS NOT BEING USED.



REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation

A/E CONTRACT NO. N62470-93-D-3032

ACTIVITY — SERVICED BY:

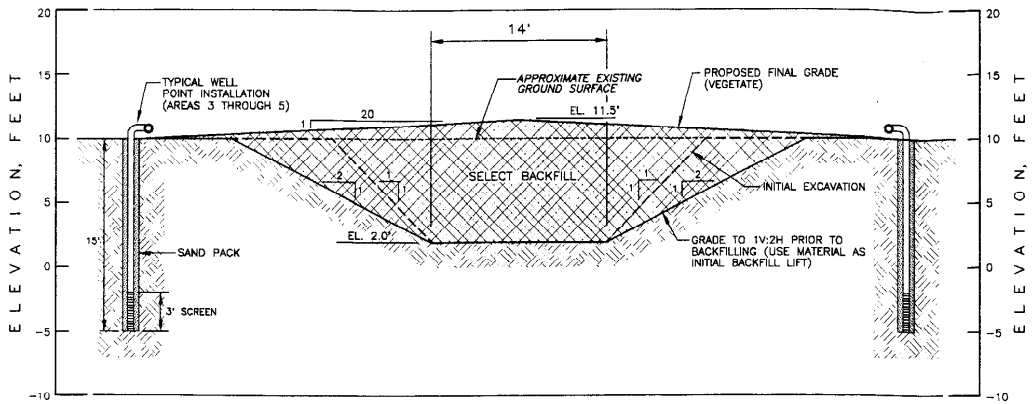
TOP SEC FOR COMMANDER NAVFAC

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
NAVAL STATION
NAVAL BASE, NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B
SOIL AND DEBRIS REMOVAL ACTION

DECONTAMINATION PAD – PLAN, SECTIONS, AND DETAILS

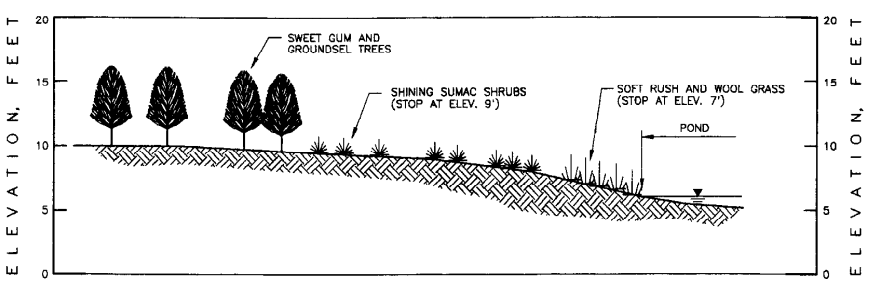
CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC NO.	
CONSTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	
SHEET	OF

RA-5



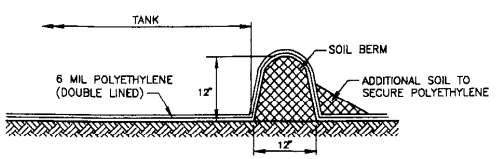
SECTION (A)
TYPICAL FOR AREAS 3 THROUGH 7

SCALE
5 0 5 10 FEET

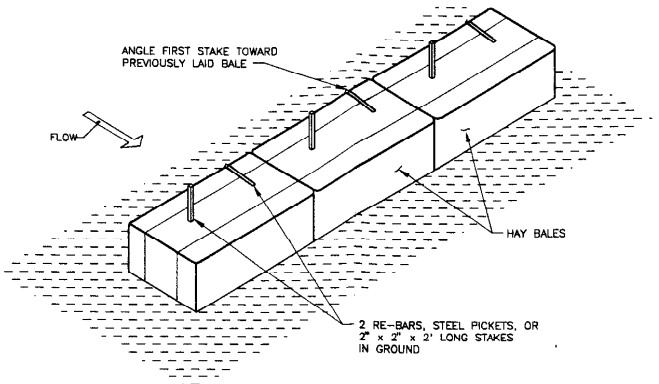


SECTION (B)
TYPICAL WETLANDS SECTION

SCALE
5 0 5 10 FEET



TYPICAL FUEL STORAGE SECONDARY CONTAINMENT
N. T. S.

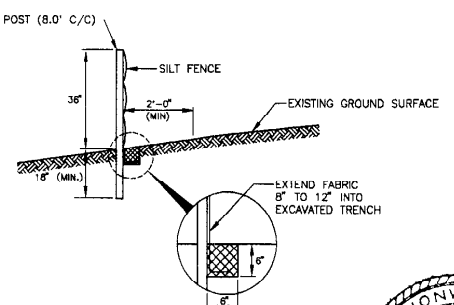


ANCHORING DETAIL

DETAIL (2) STRAW BALE BARRIER INSTALLATION
N. T. S.

NOTES:

1. BALES SHALL BE PLACED IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. BALES WILL BE KEYED INTO THE GROUND.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY STAKES OR RE-BARS DRIVEN THROUGH THE BALES. THE FIRST STAKE IN EACH BALE SHALL BE ANGLED TOWARD PREVIOUSLY LAID BALE TO FORCE BALES TOGETHER.
4. BALES TO BE PLACED AS SHOWN ON THE PLANS OR OTHERWISE AS DIRECTED BY THE SITE SUPERVISOR.



DETAIL (1) SILT FENCE INSTALLATION
N. T. S.

NOTES:

1. TAKE ALL SLACK OUT OF FABRIC BEFORE ATTACHING TO STAKES.
2. FENCE TO BE PLACED AS SHOWN ON THE PLANS OR AS OTHERWISE DIRECTED BY THE SITE SUPERVISOR.
3. SILT FENCE WILL BE REMOVED AFTER SEEDING HAS ACHIEVED ADEQUATE GROWTH TO PREVENT EROSION OR AS OTHERWISE DIRECTED BY THE SITE SUPERVISOR.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
JOSEPH W. COLELLA
No. 27115-E

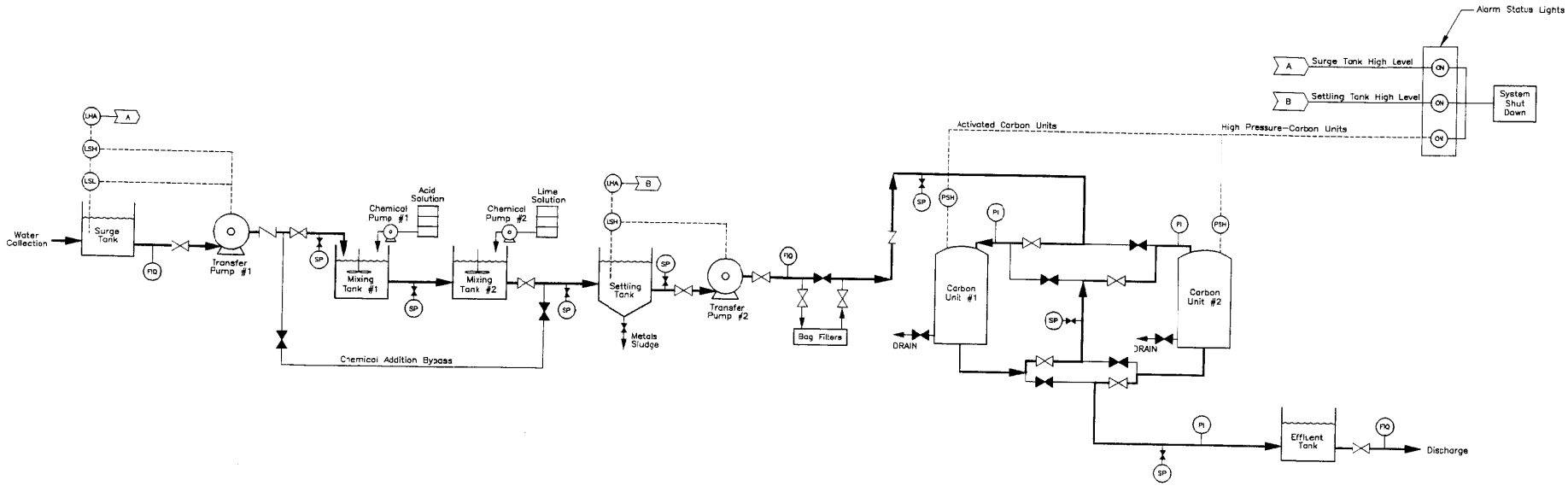
REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation
A/E CONTRACT NO. N62470-93-D-3032

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B NAVAL BASE, NORFOLK, VIRGINIA
SOIL AND DEBRIS REMOVAL ACTION
MISCELLANEOUS DETAILS

CODE ID. NO. 80091	SIZE D
SCALE:	AS SHOWN
EFD NO.	
STA. PROJECT NO.	
SPEC NO.	
CONSTR. CONTRACT NO.	N62470-93-D-3032
NAVFAC DRAWING NO.	
SHEET	OF
	RA-6



LEGEND

SYMBOL	DESCRIPTION
○	INSTRUMENT/LIGHT IS MOUNTED LOCALLY
—▷◁—	VALVE (NORMALLY OPEN)
—▶◀—	VALVE (NORMALLY CLOSED)
—⊣—	CHECK VALVE
A	LINE CONTINUATION
P	PUMP

SYMBOL	DESCRIPTION
LHA	HIGH LEVEL ALARM
LSH	HIGH LEVEL SWITCH
LSL	LOW LEVEL SWITCH
PI	PRESSURE INDICATOR
PSH	HIGH PRESSURE SWITCH
SP	SAMPLE PORT POINT
FIQ	TOTAL FLOW INDICATOR

LINE TYPES	
———	MAIN PROCESS LINE
———	SECONDARY PROCESS LINE
- - - - -	SIGNAL PATHS

REVISIONS

SYMBOL	DESCRIPTION	DATE	APPROVED BY

OHM Corporation
A/E CONTRACT NO. N62470-93-D-3032

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
CAMP ALLEN LANDFILL, AREA B NAVAL BASE, NORFOLK, VIRGINIA
SOIL AND DEBRIS REMOVAL ACTION

PROCESS AND INSTRUMENTATION DIAGRAM

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
EFD NO.
STA. PROJECT NO.
SPEC NO.
CONSTR. CONTRACT NO. N62470-93-D-3032
NAVFAC DRAWING NO.
SHEET OF
RA-7

APPENDIX B

APPENDIX B

DRYING AND DECONTAMINATION PAD DESIGN CALCULATIONS

OHM Corporation

COMPUTATION SHEET

Project Number 15444 Page 1 of 2
Project Name CAMP ALLEN AREA B
Project Location NORFOLK, VA

Subject DRYING / DECONTAMINATION PAD ASPHALT & BASE THICKNESS
Prepared By JRF Date DEC. 20, 1993
Checked By JJG Date 1-7-94

FROM STANDARD FOR CIVIL ENGINEERS THIRD EDITION

FOR FLEXIBLE PAVEMENT DESIGN

ASSUME SOIL SUPPORT NO. $S = 8$
REGIONAL FACTOR $R = 1$
TERMINAL SERVICEABILITY $p_t = 2.0$

USING A CAT 936 LOADER W/ 3.0 cy BUCKET -
LOADER WEIGHT EMPTY 27,221 LB
WEIGHT of MATERIAL IN BUCKET 8,910 Lb
TOTAL LOADER WEIGHT 36,131 LB
= 36 KIPS
∴ AXLE LOAD = ½ TOTAL = 18 KIPS

PRODUCTION - MATERIAL REMOVED FROM PAD EACH DAY
500 CY
∴ NUMBER of TRIPS ACROSS PAD =
$500\ CY/DAY \times 1\ TRIP/3\ yd^3 = 167\ TRIPS/DAY$

∴ FROM TABLE NO. 16-19 Pg 16-56

$SN = 1.42$

CALCULATE REQUIRED MATERIAL DEPTHS

FROM Pg 16-50 EQUATION 16-5

$$SN = a_1 D_1 + a_2 D_2 + a_3 D_3$$

FROM TABLE 16-20
STRUCTURAL LAYER COEFFICIENTS

SURFACE COURSE - ROAD MIX $a_1 = 0.2$ ~~0.2~~ 0.44 (PENNDOT Guidance)
BASE COURSE - BITUMINOUS TREATED $a_2 = 0.34$ 0.4
SUBBASE COURSE - SANDY GRAVEL $a_3 = 0.11$

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER No. 27115-E

JW Colella
3-11-94

OHM Corporation

COMPUTATION SHEET

Project Number 15444 Page 2 of 2
Project Name CAMP ALLEN AREA B
Project Location NORFOLK VA

Subject DRYING / DECONTAMINATION PAD Prepared By JRF Date DEC. 20, 1993
Checked By JJG Date 1-7-94

Assume 1" of SURFACE COURSE
3" of BASE COURSE
6" of SUBBASE COURSE

$\therefore SN = a_1 D_1 + a_2 D_2 + a_3 D_3$

$= \overset{0.44}{0.22}(1) + \overset{0.4}{0.34}(3) + 0.11(6)$

$SN = 1.88 > 1.42 \quad \therefore$ OK ✓

2.3

Standard Handbook for CIVIL ENGINEERS

Third Edition

Frederick S. Merritt, Editor

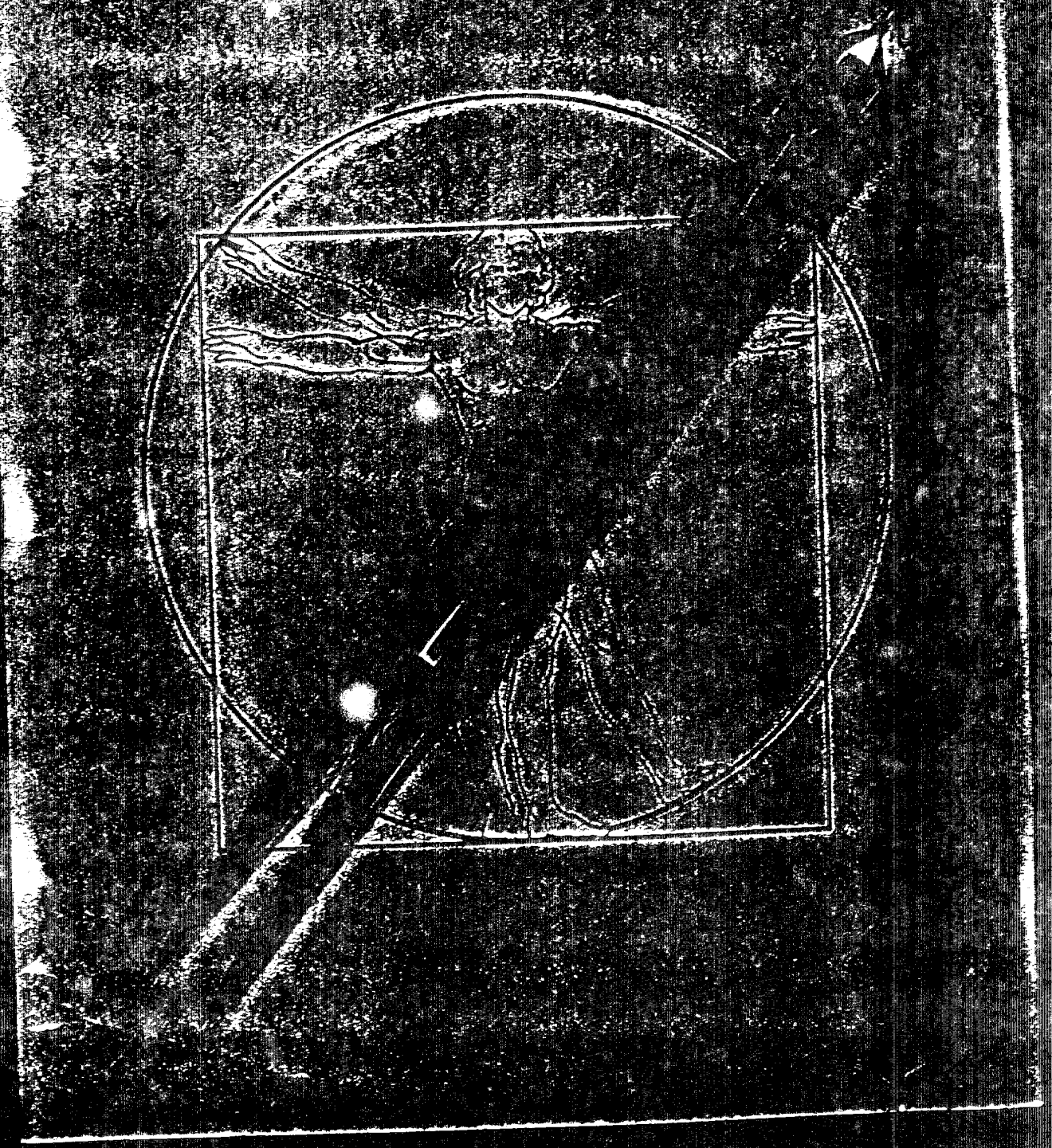


TABLE 16-17 Traffic Equivalence Factors, Flexible Pavement*

a. SINGLE AXLES, $p_t = 2.0$

Axle load, kips	Structural number *SN*					
	1	2	3	4	5	6
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
4	0.002	0.003	0.002	0.002	0.002	0.002
6	0.01	0.01	0.01	0.01	0.01	0.01
8	0.03	0.04	0.04	0.03	0.03	0.03
10	0.08	0.08	0.09	0.08	0.08	0.08
12	0.16	0.18	0.19	0.18	0.17	0.17
14	0.32	0.34	0.35	0.35	0.34	0.33
16	0.59	0.60	0.61	0.61	0.60	0.60
18	1.00	1.00	1.00	1.00	1.00	1.00
20	1.61	1.59	1.56	1.55	1.57	1.60
22	2.49	2.44	2.35	2.31	2.35	2.41
24	3.71	3.62	3.43	3.33	3.40	3.51
26	5.36	5.21	4.88	4.68	4.77	4.96
28	7.54	7.31	6.78	6.42	6.52	6.83
30	10.38	10.03	9.24	8.65	8.73	9.17
32	14.00	13.51	12.37	11.46	11.48	12.17
34	18.55	17.87	16.30	14.97	14.87	15.63
36	24.20	23.30	21.16	19.28	19.02	19.93
38	31.14	29.95	27.12	24.55	24.03	25.10
40	39.57	38.02	34.34	30.92	30.04	31.25

b. TANDEM AXLES, $p_t = 2.0$

Axle load, kips	Structural number *SN*					
	1	2	3	4	6	8
10	0.01	0.01	0.01	0.01	0.01	0.01
12	0.01	0.02	0.02	0.01	0.01	0.01
14	0.02	0.03	0.03	0.03	0.02	0.02
16	0.04	0.05	0.05	0.05	0.04	0.04
18	0.07	0.08	0.08	0.08	0.07	0.07
20	0.10	0.12	0.12	0.12	0.11	0.10
22	0.16	0.17	0.18	0.17	0.16	0.16
24	0.23	0.24	0.26	0.25	0.24	0.23
26	0.32	0.34	0.36	0.35	0.34	0.33
28	0.45	0.46	0.49	0.48	0.47	0.46
30	0.61	0.62	0.65	0.64	0.63	0.62
32	0.81	0.82	0.84	0.84	0.83	0.82
34	1.06	1.07	1.08	1.08	1.08	1.07
36	1.38	1.38	1.38	1.38	1.38	1.38
38	1.76	1.75	1.73	1.72	1.73	1.74
40	2.22	2.19	2.15	2.13	2.16	2.18
42	2.77	2.73	2.64	2.62	2.66	2.70
44	3.42	3.36	3.23	3.18	3.24	3.31
46	4.20	4.11	3.92	3.83	3.91	4.02
48	5.10	4.98	4.72	4.58	4.68	4.83

c. SINGLE AXLES, $p_t = 2.5$

Axle load, kips	Structural number *SN*					
	1	2	3	4	5	6
2	0.0004	0.0004	0.0003	0.0002	0.0002	0.0002
4	0.003	0.004	0.004	0.003	0.003	0.002

: Pavement*

5	6
0.0002	0.0002
0.002	0.002
0.01	0.01
0.03	0.03
0.08	0.08
0.17	0.17
0.34	0.33
0.60	0.60
1.00	1.00
1.57	1.60
2.35	2.41
3.40	3.51
4.77	4.96
6.52	6.83
8.73	9.17
11.48	12.17
14.87	15.63
19.02	19.93
24.03	25.10
30.04	31.25

6	8
.01	0.01
.01	0.01
0.02	0.02
0.04	0.04
.07	0.07
.11	0.10
.16	0.16
0.24	0.23
0.34	0.33
.47	0.46
.63	0.62
.83	0.82
1.08	1.07
1.38	1.38
.73	1.74
.16	2.18
.66	2.70
3.24	3.31
3.91	4.02
.68	4.83

5	6
0.0002	0.0002
0.003	0.002

TABLE 16-17 *(Continued)*

c. SINGLE AXLES, $p_t = 2.5$

Axle load, kips	Structural number *SN*					
	1	2	3	4	5	6
6	0.01	0.02	0.02	0.01	0.01	0.01
8	0.03	0.05	0.05	0.04	0.03	0.03
10	0.08	0.10	0.12	0.10	0.09	0.08
12	0.17	0.20	0.23	0.21	0.19	0.18
14	0.33	0.36	0.40	0.39	0.36	0.34
16	0.59	0.61	0.65	0.65	0.62	0.61
18	1.00	1.00	1.00	1.00	1.00	1.00
20	2.61	1.57	1.49	1.47	1.51	1.55
22	2.48	2.38	2.17	2.09	2.18	2.30
24	3.69	3.49	3.09	2.89	3.03	3.27
26	5.33	4.99	4.31	3.91	4.09	4.48
28	7.49	6.98	5.90	5.21	5.39	5.98
30	10.31	9.55	7.94	6.83	6.97	7.79
32	13.90	12.82	10.52	8.85	8.88	9.95
34	18.41	16.94	13.74	11.34	11.18	12.51
36	24.02	22.04	17.73	14.38	13.93	15.50
38	30.90	28.30	22.61	18.06	17.20	18.98
40	39.26	35.89	28.51	22.50	21.08	23.04

d. TANDEM AXLES, $p_t = 2.5$

Axle load, kips	Structural number *SN*					
	1	2	3	4	5	6
10	0.01	0.01	0.01	0.01	0.01	0.01
12	0.02	0.02	0.02	0.02	0.01	0.01
14	0.03	0.04	0.04	0.03	0.03	0.02
16	0.04	0.07	0.07	0.06	0.05	0.04
18	0.07	0.10	0.11	0.09	0.08	0.07
20	0.11	0.14	0.16	0.14	0.12	0.11
22	0.16	0.20	0.23	0.21	0.18	0.17
24	0.23	0.27	0.31	0.29	0.26	0.24
26	0.33	0.37	0.42	0.40	0.36	0.34
28	0.45	0.49	0.55	0.53	0.50	0.47
30	0.61	0.65	0.70	0.70	0.66	0.63
32	0.81	0.84	0.89	0.89	0.86	0.83
34	1.06	1.08	1.11	1.11	1.09	1.08
36	1.38	1.38	1.38	1.38	1.38	1.38
38	1.75	1.73	1.69	1.68	1.70	1.73
40	2.21	2.16	2.06	2.03	2.08	2.14
42	2.76	2.67	2.49	2.43	2.51	2.61
44	3.41	3.27	2.99	2.88	3.00	3.16
46	4.18	3.98	3.58	3.40	3.55	3.79
48	5.08	4.80	4.25	3.98	4.17	4.49

*From "Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials, 1972.

ıch lane when there is a total of four lanes in both directions, and from 60 to 80% of the one-rection traffic to one or more of the outer lanes, with lesser values to inner lanes, when there e six or more lanes in both directions.

See also the following discussions of flexible pavements and portland cement concrete ıvements.

TABLE 16-18 Traffic Equivalence Factors, Rigid Pavement*

a. SINGLE AXLES, $p_t = 2.0$

Axle load, kips	Slab thickness D, in					
	6	7	8	9	10	11
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
4	0.002	0.002	0.002	0.002	0.002	0.002
6	0.01	0.01	0.01	0.01	0.01	0.01
8	0.03	0.03	0.03	0.03	0.03	0.03
10	0.09	0.08	0.08	0.08	0.08	0.08
12	0.19	0.18	0.18	0.18	0.17	0.17
14	0.35	0.35	0.34	0.34	0.34	0.34
16	0.61	0.61	0.60	0.60	0.60	0.60
18	1.00	1.00	1.00	1.00	1.00	1.00
20	1.55	1.56	1.57	1.58	1.58	1.59
22	2.32	2.32	2.35	2.38	2.40	2.41
24	3.37	3.34	3.40	3.47	3.51	3.53
26	4.76	4.69	4.77	4.88	4.97	5.02
28	6.59	6.44	6.52	6.70	6.85	6.94
30	8.92	8.68	8.74	8.98	9.23	9.39
32	11.87	11.49	11.51	11.82	12.17	12.44
34	15.55	15.00	14.95	15.30	15.78	16.18
36	20.07	19.30	19.16	19.53	20.14	20.71
38	25.56	34.54	24.26	24.63	25.36	26.14
40	32.18	30.85	30.41	30.75	31.58	32.57

b. TANDEM AXLES, $p_t = 2.0$

Axle load, kips	Slab thickness D, in					
	6	7	8	9	10	11
10	0.01	0.01	0.01	0.01	0.01	0.01
12	0.03	0.03	0.03	0.03	0.03	0.03
14	0.05	0.05	0.05	0.05	0.05	0.05
16	0.09	0.08	0.08	0.08	0.08	0.08
18	0.14	0.14	0.13	0.13	0.13	0.13
20	0.22	0.21	0.21	0.20	0.20	0.20
22	0.32	0.31	0.31	0.30	0.30	0.30
24	0.45	0.45	0.44	0.44	0.44	0.44
26	0.63	0.64	0.62	0.62	0.62	0.62
28	0.85	0.85	0.85	0.85	0.85	0.85
30	1.13	1.13	1.14	1.14	1.14	1.14
32	1.48	1.45	1.49	1.50	1.51	1.51
34	1.91	1.90	1.93	1.95	1.96	1.97
36	2.42	2.41	2.45	2.49	2.51	2.52
38	3.04	3.02	3.07	3.13	3.17	3.19
40	3.79	3.74	3.80	3.89	3.95	3.98
42	4.67	4.59	4.66	4.78	4.87	4.93
44	5.72	5.59	5.67	5.82	5.95	6.03
46	6.94	6.76	6.83	7.02	7.20	7.31
48	8.36	8.12	8.17	8.40	8.63	8.79

c. SINGLE AXLES, $p_t = 2.5$

Axle load, kips	*Slab thickness D, in*					
	6	7	8	9	10	11
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
4	0.003	0.002	0.002	0.002	0.002	0.002

TABLE 16-18 *(Continued)*

c. SINGLE AXLES, $p_t = 2.5$

Axle load, kips	Slab thickness D, in					
	6	7	8	9	10	11
6	0.01	0.01	0.01	0.01	0.01	0.01
8	0.04	0.04	0.03	0.03	0.03	0.03
10	0.10	0.09	0.08	0.08	0.08	0.08
12	0.20	0.19	0.18	0.18	0.18	0.17
14	0.38	0.36	0.35	0.34	0.34	0.34
16	0.63	0.62	0.61	0.60	0.60	0.60
18	1.00	1.00	1.00	1.00	1.00	1.00
20	1.51	1.52	1.55	1.57	1.58	1.58
22	2.21	2.20	2.28	2.34	2.38	2.40
24	3.16	3.10	3.23	3.36	3.45	3.50
26	4.41	4.26	4.42	4.67	4.85	4.95
28	6.05	5.76	5.92	6.29	6.61	6.81
30	8.16	7.67	7.79	8.28	8.79	9.14
32	10.81	10.06	10.10	10.70	11.43	11.99
34	14.12	13.04	12.94	13.62	14.59	15.43
36	18.20	16.69	16.41	17.12	18.33	19.52
38	23.15	21.14	20.61	21.31	22.74	24.31
40	29.11	26.49	25.65	26.29	27.91	29.90

d. TANDEM AXLES, $p_t = 2.5$

Axle load, kips	Slab thickness D, in					
	6	7	8	9	10	11
10	0.01	0.01	0.01	0.01	0.01	0.01
12	0.03	0.03	0.03	0.03	0.03	0.03
14	0.06	0.05	0.05	0.05	0.05	0.05
16	0.10	0.09	0.08	0.08	0.08	0.08
18	0.16	0.14	0.14	0.13	0.13	0.13
20	0.23	0.22	0.21	0.21	0.20	0.20
22	0.34	0.32	0.31	0.31	0.30	0.30
24	0.48	0.46	0.45	0.44	0.44	0.44
26	0.64	0.64	0.63	0.62	0.62	0.62
28	0.85	0.85	0.85	0.85	0.85	0.85
30	1.11	1.12	1.13	1.14	1.14	1.14
32	1.43	1.44	1.47	1.49	1.50	1.51
34	1.82	1.82	1.87	1.92	1.95	1.96
36	2.29	2.27	2.35	2.43	2.48	2.51
38	2.85	2.80	2.91	3.04	3.12	3.16
40	3.52	3.42	3.55	3.74	3.87	3.94
42	4.32	4.16	4.30	4.55	4.74	4.86
44	5.26	5.01	5.16	5.48	5.75	5.92
46	6.36	6.01	6.14	6.53	6.90	7.14
48	7.64	7.16	7.27	7.73	8.21	8.55

*From "Interim Guide for Design of Pavement Structures," American Assiociation of State Highway and Transportation Officials, 1972.

nomic Factors. An adequate structural section can be achieved with various combinations of materials. In selection of the appropriate design section, economy, both in first cost and maintenance costs, should be a primary consideration.

ement Life. The useful life of a pavement can be defined as that period of time during the pavement structure is expected to continue to function without any appreciable loss upport value, while maintaining an acceptable surface condition.

The pavement life (not to be confused with pavement design period) can be extended through the use of various maintenance measures, as well as through planned stage construction. Staged construction consists of the application of successive pavement layers in accordance with a design, taking into account traffic loadings over a predetermined time schedule. This method has many advantages, including improved pavement performance, more accurate analysis of traffic through successive evaluations, and often a more effective utilization of funds.

Flexible Pavements ▪ A flexible pavement structure may consist of two or more layers. The layers, beginning at the subgrade and following in order upward, are generally designated as subbase course, base course, and surface course. The design procedure includes determination of the total thickness of pavement structure as well as the thickness of the individual components, surface, base, and subbase courses. The procedure should include design of equivalent alternative sections, and selection of structure should be primarily a function of availability of materials and comparative costs.

Subbase Course. The subbase course is the portion of the flexible pavement structure between the subgrade and the base course. The subbase usually consists of a compacted layer of granular material, either treated or untreated, or a layer of soil treated with a suitable admixture. In addition to its position in the pavement, it is usually distinguished from the base course material by less stringent specification requirements for strength, aggregate types, and gradation.

The subbase course is usually used to build up the pavement strength economically above that provided by the subgrade soils. However, the subbase can be omitted if the required pavement structure is relatively thin or if subgrade soils are of high quality, with no moisture problems. When either is the case, the base course can be constructed directly on the subgrade.

In addition to their major function as a structural portion of the pavement, subbase courses may have additional secondary functions, such as:

1. To prevent intrusion of fine-grained roadbed soils into base courses. Relatively well-graded materials must be specified if the subbase is intended to serve this purpose.
2. To minimize the damaging effects of frost action. For this purpose, materials not susceptible to detrimental frost action should be specified.
3. To help prevent accumulation of free water within or below the pavement structure. Relatively free-draining material should be specified if the subbase is intended to serve this purpose, and provision should be made for collecting and removing accumulated water from the subbase.
4. To provide a working platform for construction equipment or for subsequent pavement courses in rock cuts.

Base Course. The base course is the portion of the flexible pavement structure immediately beneath the surface course. It is constructed on the subbase course or, if no subbase is used, directly on the subgrade. It performs its major function as a structural portion of the pavement. The base usually consists of aggregates such as crushed stone, crushed slag, or crushed or uncrushed gravel and sand, or of combinations of these materials. The aggregates may be used untreated or treated with stabilizing admixtures such as portland cement, asphalt, or lime. Generally, specifications for base-course materials are considerably more stringent than those for subbase materials in requirements for strength, stability, hardness, aggregate types, and gradation.

Requirements in AASHTO Specifications M147 and M75 are typical of specifications for gradation and quality of untreated base aggregates. However, materials varying in gradation and quality from these specifications have been used in certain areas and have provided satisfactory performance.

A wide variety of materials unsuitable for use as untreated base course have given satisfactory performance when improved by addition of a stabilizing admixture, such as portland cement, asphalt, or lime. Consideration should be given to the use of such treated materials for base courses whenever it is economically feasible, particularly when suitable untreated materials are in short supply.

Table 16-19 can be used as a guide to establishment of specification requirements for stabilized base courses. Careful study is required to select the type and amount of admixture to be used for optimum performance and economy. Use of stabilized base courses can be extremely desirable when traffic must be maintained throughout pavement construction. Plant-mixed asphalt-concrete bases are often used in these situations.

Surface Course. In addition to its major function as a structural portion of the pavement, the surface course should be designed to resist the abrasive forces of traffic, limit the amount of surface water that penetrates into the pavement, provide a skid-resistant surface, and furnish a smooth and uniform riding surface. The surface course also should be durable, able to resist fracture and raveling without becoming unstable under expected traffic and climatic conditions.

Usually constructed on a base course, the surface course of a flexible pavement structure consists of a mixture of mineral aggregates and bituminous materials. The success of such a course depends to a considerable degree on obtaining a mixture with the optimum gradation of aggregate and percent of bituminous binder. Use of a laboratory-tested design procedure or use of a proven specification is essential to insure that a mixture will be satisfactory.

Well-graded aggregates with a maximum size of about ¾ to 1 in are commonly specified for surface courses for highways. Nevertheless, a wide variety of other gradations—from sand as in *sheet asphalt,* to coarse, open-graded mixtures—has been used and provided satisfactory performance in specific conditions.

TABLE 16-19 Typical Specification Requirements for Stabilized Base Courses*

Specification	Cement-treated			Bituminous-treated		Lime-treated
	Class A	Class B	Class C	Class 1	Class 2	
Sieve analysis, % passing						
2½ in	100	100	100			
¾ in	...	...	75–95			
No. 4	65–100	55–100	25–60			
No. 10	20–45	...	15–45			
No. 40	15–30	25–50	8–30			
No. 200	5–12	5–20	2–15			
Compressive strength,† psi at 7 days	650–1,000	300–650				
Soil support value S	...	...	8.0 min			10.0 min
Stability						
Hveem Stabilometer				35 min	25 min	
Hubbard-Field				1,200 min	1,000 min	
Marshall-stability				750 min	500 min	
Marshall-flow				16 max	20 max	
Plasticity Index‡	12 max			6 max	6 max	6 max

*From "Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials, 1972.

†As determined in unconfined compression tests on cylinders 4 in in diameter and 4 in high. Test specimens should contain the same percentage of portland cement and be compacted to the same density as achieved in construction.

‡Performed on samples prepared in accordance with AASHTO T87; apply to aggregate prior to mixing with the stabilizing admixture, except that in the case of lime-treated base, the value applies after mixing.

Surface-course asphaltic concrete is usually prepared by plant mixing of heated aggregates, mineral filler, and asphalt cement. Satisfactory performance also has been obtained with plant mixing of cold aggregates and specially formulated asphalt and also by mixing the composition in place with liquid asphalts or asphalt emulsions.

Construction specifications usually require that before a surface course is placed, liquid bituminous material be applied on untreated aggregate base courses as a prime coat and on treated base courses and between layers of the surface course as a tack coat.

Minimum Layer Thickness. Design procedures that establish pavement layer thickness also should take into consideration construction requirements for placing the pavement courses. For example, it is impracticable to construct pavement courses in thicknesses less than 1¼ to 1½ times the largest aggregate size of the mixture. Considering aggregate sizes normally used, a guide for the minimum practical thicknesses that can generally be applied is:

Surface course	1½ in
Base course	3 in
Subbase course	4 in

Flexible Pavement Design Procedure. The design procedure, as outlined in the AASHTO "Interim Guide for Design of Pavement Structures," is based on design equations developed by taking into account the following parameters: terminal serviceability index p_t, equivalent 18-kip single-axle loads, and soil support value S. The last is based on an empirical scale with values from 0 to 10. $S = 3.0$ represents silty clay roadbed soils used in the AASHTO road tests (a firm and valid point), and $S = 10.0$ represents a crushed rock base used in the road tests (also a reasonably valid point).

The units of soil support represented by the soil-support scale have no direct relationship to any procedure for testing soils. It is necessary therefore to establish a correlation between soil support and some testing procedure for this design method to be utilized properly. Figure 16-17 illustrates the relationship between S and several common methods of establishing subgrade strength.

Regional factor R was included in the design equation to reflect climatic and environmental factors for conditions different from those in the road tests. Based on road test information, R values that may be used as a guide are:

Subgrade materials frozen to a depth of 5 in or more	0.2 to 1.0
Subgrade materials, dry, summer and fall	0.3 to 1.5
Subgrade materials, wet, spring thaw	4.0 to 5.0

In general, R should not exceed about 4.0 or be less than about 0.5 for conditions in the United States. The regional factor may not adjust correctly for special conditions, such as serious frost conditions or other local problems.

Structural number SN is an abstract number expressing the structural strength of pavement required for a given combination of soil-support value, total equivalent 18-kip single-axle loads, terminal serviceability index, and regional factor. The required SN must be converted to actual thicknesses of surfacing, base, and subbase by means of appropriate layer coefficients, which represent the relative strength of the material to be used for each layer, as outlined below.

SN for the entire pavement may be obtained from

$$SN = a_1D_1 + a_2D_2 + a_3D_3 \qquad (16\text{-}5)$$

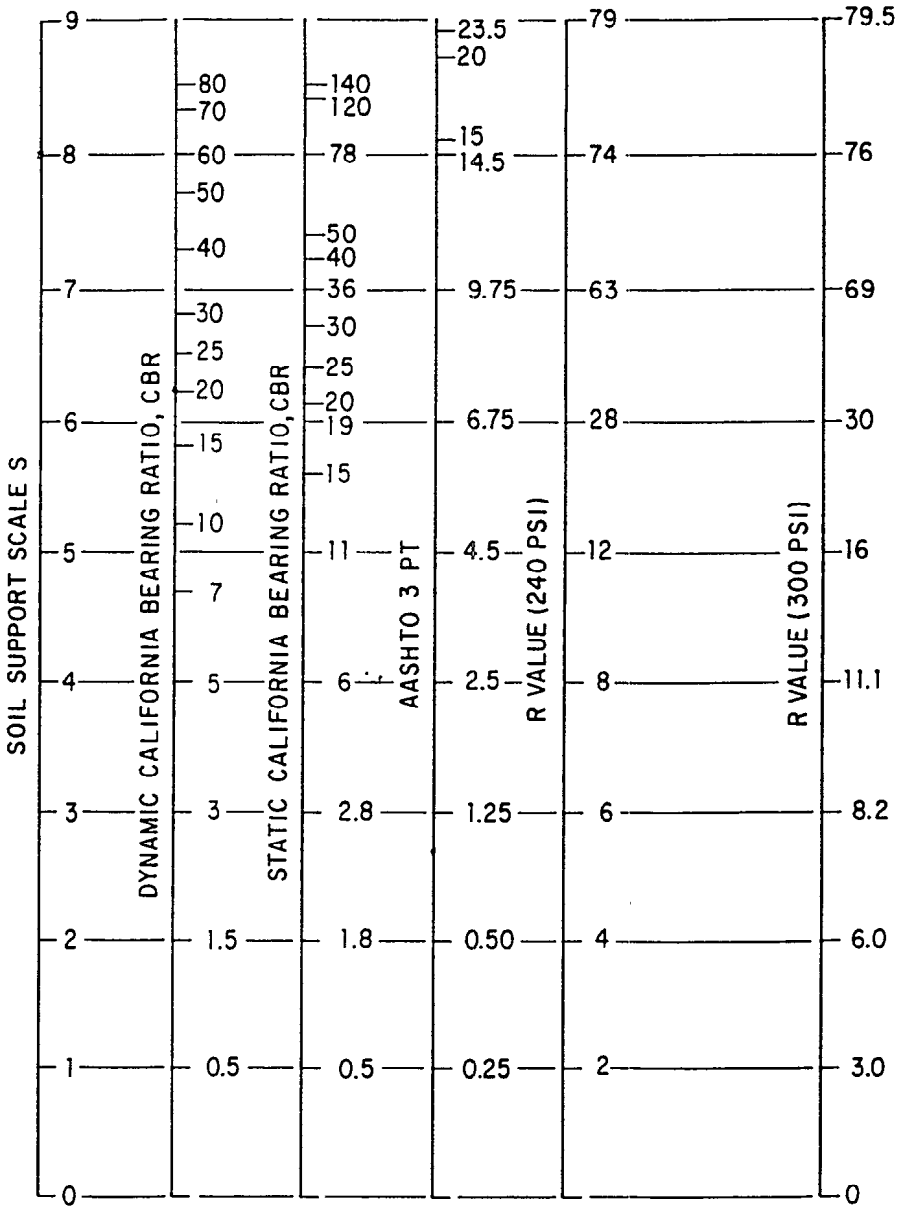


Fig. 16-17. Chart indicates equivalence of soil-support values S and soil-bearing determinations made by several common methods for evaluating subgrade strengths. *("Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials.)*

where a_1, a_2, a_3 = layer coefficients representative of surface, base, and subbase courses, respectively

D_1, D_2, D_3 = actual thickness, in, of surface, base, and subbase courses, respectively

Layer coefficients are assigned to materials used in the pavement structure to convert structural numbers to actual thickness. The layer coefficient for a material expresses the empirical

relationship between SN and thickness and is a measure of the relative ability of the material to function as a structural component of the pavement. Average values of layer coefficients for the materials used in AASHTO road tests are as follows:

Asphaltic-concrete surface course	0.44
Crushed-stone base course	0.14
Sandy gravel subbase course	0.11

Table 16-20 may be used as a guide to ranges of layer coefficients that were developed by AASHTO. Table 16-21 lists layer coefficients in use for various materials, reported in a survey of several states. In most cases, a layer-coefficient value, or a range of values, is assigned on the basis of a description of a material type. A few states evaluate or measure the coefficient by a laboratory test on the material in the pavement structure.

TABLE 16-20 Structural Layer Coefficients Proposed by AASHTO Committee on Design*

Pavement component	Coefficient
Surface Course	
Road mix (low stability)	0.20
Plant mix (high stability)	0.44†
Sand asphalt	0.40
Base Course	
Sandy gravel	0.07§
Crushed stone	0.14†
Cement-treated (no soil-cement)	
Compressive strength @ 7 days	
650 psi or more‡	0.23§
400 psi to 650 psi	0.20
400 psi or less	0.15
Bituminous-treated	
Coarse-graded	0.34§
Sand asphalt	0.30
Lime-treated	0.15–0.30
Subbase Course	
Sandy gravel	0.11†
Sand or sandy clay	0.05–0.10

*From "Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials, 1972.
†Established from AASHTO road tests.
‡Compressive strength at 7 days.
§This value has been estimated from AASHTO road tests, but not to the accuracy of those factors marked with †.

Use of Design Charts. The design equation for flexible pavements is presented in the form of two nomographs for simplicity of application. Separate nomographs are presented for a terminal serviceability index $p_t = 2.5$ (Fig. 16-18) and $p_t = 2.0$ (Fig. 16-19).

Figure 16-18 is intended for use in design of major highways and assumes that resurfacing or reconstruction will be performed when the level of serviceability reaches 2.5.

Figure 16-19 may be used for other highways where a somewhat lesser level of serviceability (2.0) may be tolerated. For design of temporary highways or for stage construction, an appropriate traffic analysis period should be used.

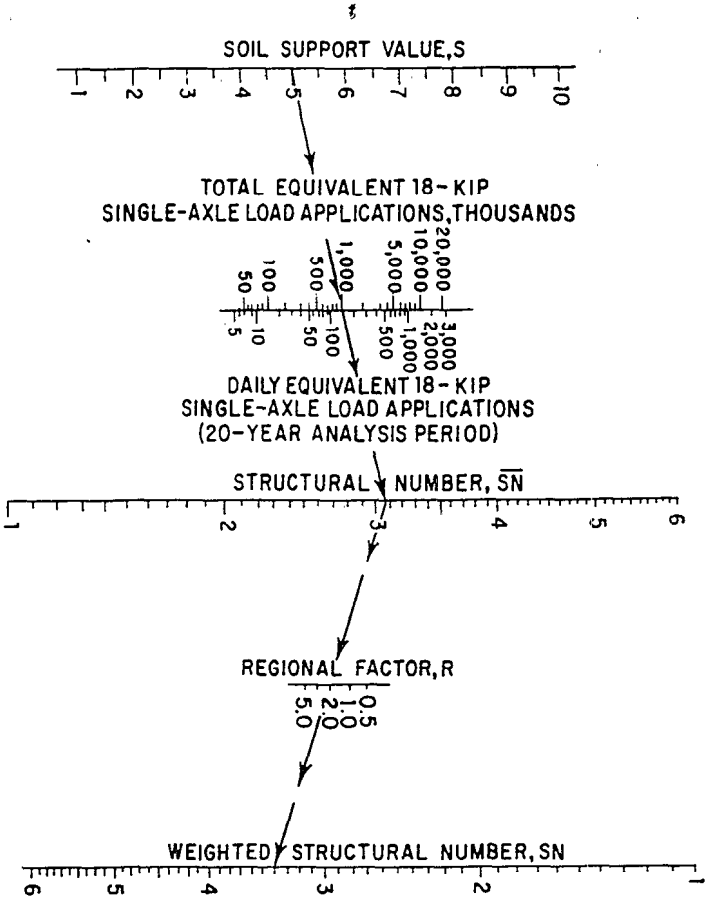


Fig. 16-18. Design chart for flexible pavement, with terminal serviceability index p_t = 2.5. (*"Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials.*)

Once the decision about the terminal serviceability index p_t has been made and the appropriate design chart has been selected, the following should be determined:

Representative values of soil support S for the subgrade soil.

The total or daily equivalent 18-kip single-axle loads estimated for the design lane for the traffic analysis period. Because selection of the traffic equivalence factors to be used to convert mixed traffic to total equivalent 18-kip single-axle loads depends on the structural number SN (Table 16-17), this number must be assumed for the initial conversion. The use of an SN of 3 for determination of 18-kip single-axle traffic-equivalence factors will normally give results sufficiently accurate for design purposes, even though the final SN determined is substantially different. This assumption usually results in a conservative estimate of equivalent 18-kip single-axle load applications, but generally the resulting error in SN is not significant.

The regional factor R applicable to the region.

The chart (Fig. 16-18 or 16-19) requires two applications of a straightedge for each solution. First, the soil-support value of the subgrade soil (on the left scale) and the total or daily equiv-

TABLE 16-21 Structural Layer Coefficients Used by Various States*

Component	Alabama	Arizona	Delaware	Massachusetts	Minnesota	Montana	Nevada	New Hampshire
Surface Courses								
Plant mix (high stability)	0.44	0.35–0.44	0.35–0.40	0.44	0.315	0.30–0.40	0.30–0.35	0.38
Road mix (low stability)	0.20	0.25–0.38				0.20	0.17–0.25	0.20
Sand Asphalt	0.40	0.25			Plant mix (low stab.) 0.28			0.20
Base Courses								
Untreated	Limestone 0.14 Slag 0.14 Sandstone 0.13 Granite 0.12	Sand & gravel, well graded 0.14 cinders 0.12–0.14 Sandy gravel, mostly sand 0.11–0.13	Waterbound macadam 0.20 Crusher run 0.14 Quarry waste 0.11 Select borrow 0.08	Crushed stone 0.14	Crushed rock (Cl. 5 & 6 gravel) 0.14 Sandy gravel 0.07	Select surf 0.10 Crushed gravel 0.12–0.14	Crushed gravel 0.10–0.12 Crushed rock 0.13–0.16	Crushed gravel 0.10 Bank run gravel 0.07 Crushed stone 0.14
Cement-treated								
650 psi or more	0.23	500 psi + 0.25–0.30	Soil-cement 0.20			400 psi or more 0.20		gravel 0.17
400 to 650 psi	0.20	300–500 psi 0.18–0.25						
400 psi or less	0.15	less than 300 psi 0.15				0.15		
Lime-treated						0.15–0.20		
Bituminous-treated	Course graded 0.030 Sand 0.25	Sand-gravel 0.25–0.34 Sand 0.20	Asph. stab. 0.10	Black base 0.34 Penetrated crushed stone 0.29	0.175–0.21	Plant mix 0.30 Bit. stab. 0.20	Plant mix 0.25–0.34	Bit. conc. 0.34 Gravel 0.24
Subbase	Sand & sandy clay 0.11 Chert, low P.I. 0.10	Sand-gravel, well graded 0.14 Cr. stone or cinders 0.12	Select borrow 0.08	Gravel 0.11 Select material 0.08	Sandy gravel (Cl. 3 & 4 gravel) 0.105 Selected granular	Sand 0.05 Sp. borrow 0.07	Gravel type 1 0.09–0.11 Select material 0.05–0.09	Sand-gravel 0.05

Topsoil 0.09 Float gravel 0.09 Sand & silty clay 0.05	Sand & silty clay 0.05–0.10	(12% minus No. 200) 0.07

Notes:
1. Indiana, Iowa, Montana, New Jersey, Tennessee, and Puerto Rico conform to AASHTO Guides
2. North Carolina conforms to AASHTO Guides, except 0.30 for bituminous-treated base
3. North Dakota conforms to AASHTO Guides, except 0.30 for bituminous aggregate base
4. Maine conforms to AASHTO Guides with some modification. No further information.
5. Maryland substitution values for materials to replace design thickness of asphalt hot-mix are the AASHTO coefficients expressed in equivalent values, in.

*From "Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials, 1972.

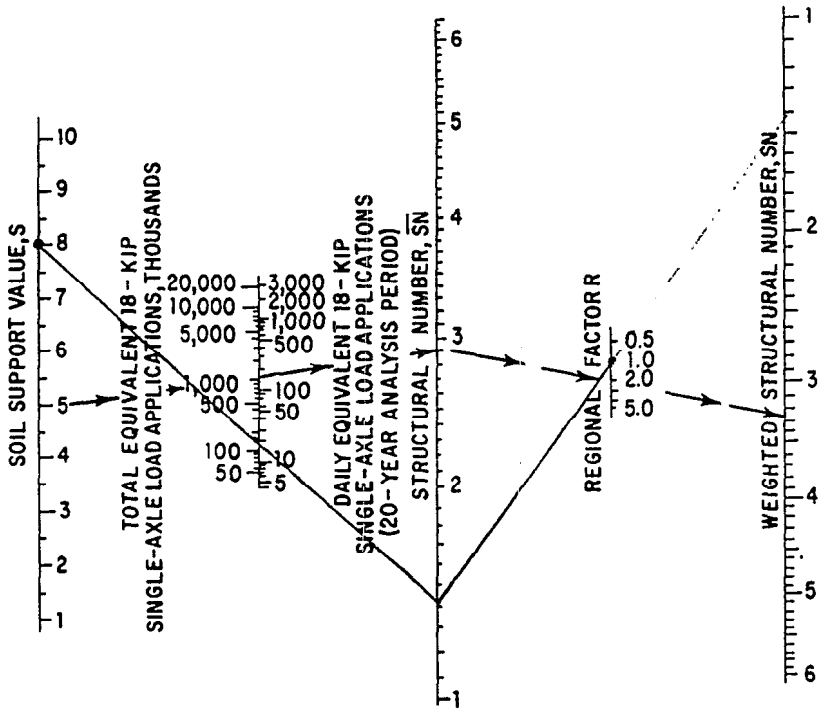


Fig. 16-19. Design chart for flexible pavement, with $p_t = 2.0$. *("Interim Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials.)*

alent 18-kip single-axle loads for the traffic analysis period (second scale) are used to solve for the unweighted structural number (center scale). This unweighted structural number is used with the selected regional factor (fourth scale) to solve for the design SN (right scale) applicable to the total pavement structure. Suitable designs are those whose combinations of materials, types, and thicknesses satisfy Eq. (16-5).

If available alternative types of material are to be considered for one or more of the pavement courses, the preceding procedure may be used to prepare the alternative designs of equal total, weighted structural numbers. The resulting alternative designs may then be compared, and the optimum design may be selected on the basis of economics and other applicable considerations.

Full-Depth Asphalt Pavements ▪ A full-depth asphalt pavement is a pavement structure in which asphalt and aggregate mixtures are employed for all courses above the subgrade. There are certain advantages to using this type of pavement construction where availability of material, economic, and construction considerations warrant its use. Some of the advantages of full-depth asphalt pavement are:

1. The construction time is reduced, as compared with a mixed material pavement.
2. It has no permeable granular layers to entrap water and impair performance.
3. The pavement structure is thinner than if untreated granular courses are used.
4. The completed course can be used to serve traffic during construction.

OHM Corporation

COMPUTATION SHEET

Project Number 15444 Page 1 of 4
Project Name CAMP ALLEN AREA B
Project Location NORFOLK, VA.

Subject DRYING / DECONTAMINATION PAD ASPHALT CURB
Prepared By JRF Date DEC. 18, 1993
Checked By JG Date 1-7-94

DESIGN FOR 10 YR, 24-hour STORM:

RAINFALL ≅ 5.9 INCHES (VESCH, 1992)

SO THAT 5.9 INCHES of RAIN WILL BE CONTAINED ON ASHALT PAD IF SUMP(S) ARE CLOSED off.

ASSUME: design CURB FOR DRYING SIDE AND STOCK PILE / DECON SIDE SEPARATELY TO REDUCE RECONTAMINATION OF DECONTAMINATED MATERIALS

DRYING SIDE

$50 * 80 * 5.9\ ^{IN}/_{FT} * {}^{1FT}/_{12IN} * \frac{7.48 gAL}{FT^3} = 14,710$ GALLONS

DECON SIDE

$50 * 80 * 5.9\ ^{IN}/_{FT} * {}^{1FT}/_{12IN} * \frac{7.48 gAL}{FT^3} = 14,710$ GALLONS

29,420 gAL. STORAGE VOLUME REQ'D

CALCULATE AREA / VOLUME LOSS DUE TO

IMPACTED SOIL STOCKPILES - ASSUME 20-FOOT DIAMETER

AREA = $\pi(10')^2 = 314 FT^2$ = a 32' x 10' AREA

$\frac{1}{2}(10)(1.25)(32) = 200\ FT^3$ (1.25 = 5% slope - too steep use 1% ir. 25')

299 gAL
x 2 PILES
= 2,992 gAL
600 gAL

MATERIAL STOCKPILES - ASSUME 20-FOOT DIAMETER
ASSUME 2 PILES
THEREFORE SAME VOLUME LOSS AS IMPACTED SOIL STOCKPILE = 2,992 gAL
600

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
JOSEPH W. COLELLA
ENGINEER
No. 27115-E

J W Colella

5-1118 8/23/93 3-10-94

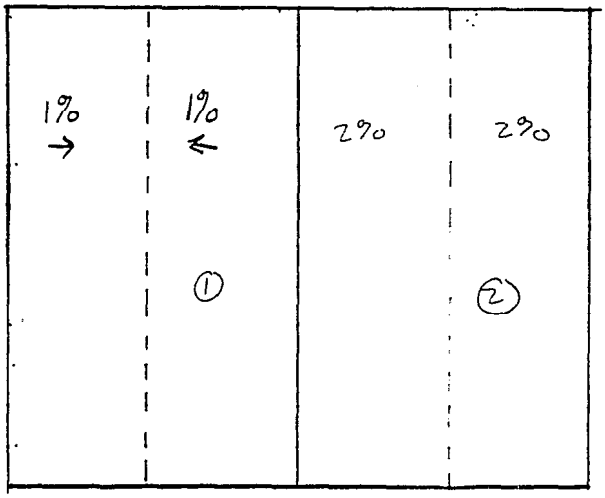
OHM Corporation

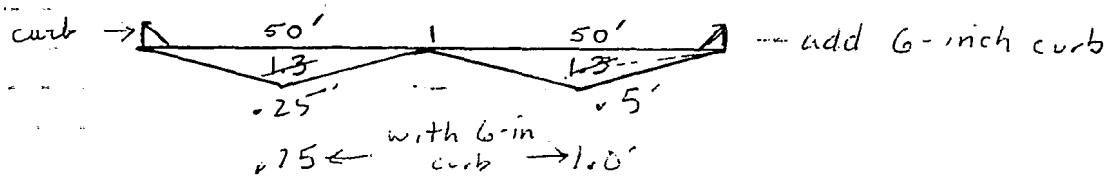
COMPUTATION SHEET

Project Number 15444 Page 2 of 4
Project Name CAMP ALLEN AREA B
Project Location

Subject
Prepared By Date
Checked By JJG Date 1-7-94

STORAGE VOLUME NEEDED = 29,420 GALLONS





CALCULATE STORAGE VOLUMES WITH 1.3' CURB DUE TO 1% & 2% SLOPES RESPECTIVELY:

VOLUME 1

$\frac{1}{2}bHL = \frac{1}{2}(50)(80)(\frac{25}{1.25}) = \frac{500}{2500}$ FT^3

~~18700~~ GAL = 3740 gal
− 2992 GAL = 600
= 15700 GAL 3140 gal

VOLUME 2

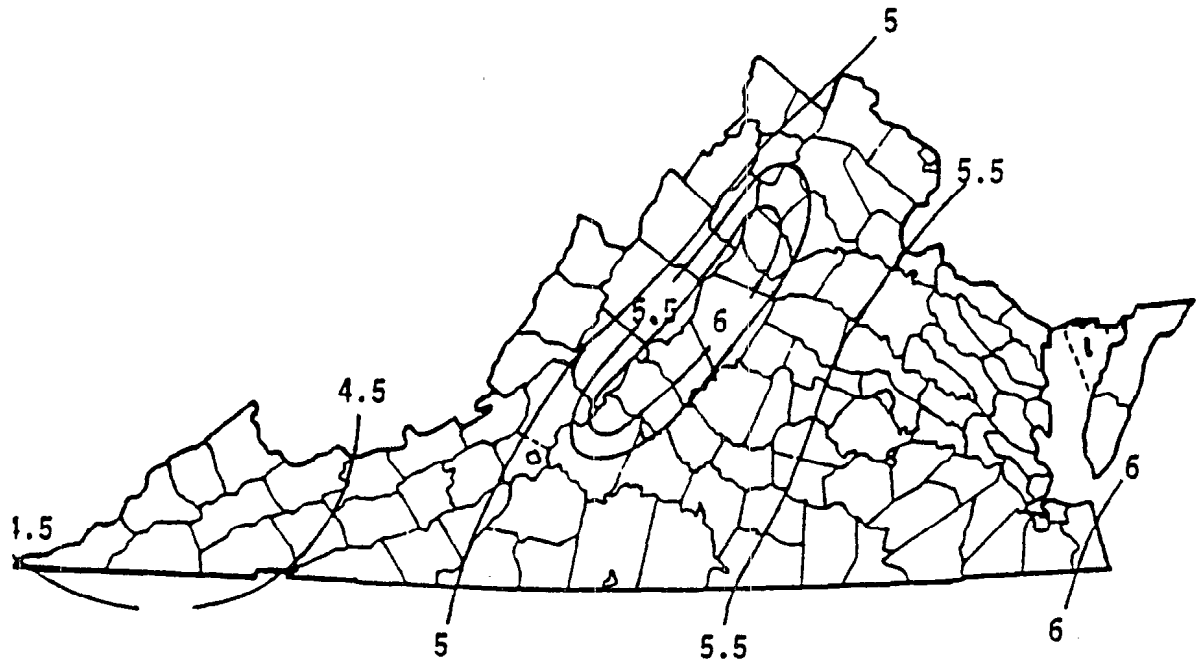
AREA ~~SAME AS AREA 1~~ $\frac{1}{2}(50)(80)(.5) = 1000$ ft^3
= 7480

∴ 15700 GAL

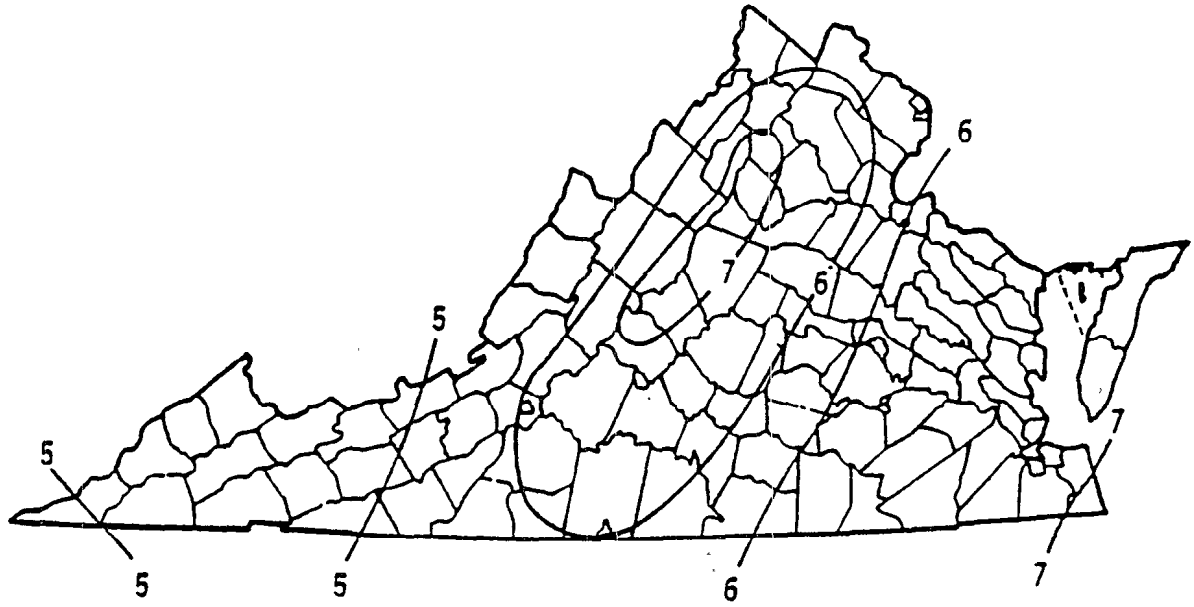
31,400 GALLON > 29420 GALLON O.K.

3140 + 7480 = 10620 gal < 29420 gal NG. SEE attached page

RAINFALL DEPTHS FOR SELECTED DESIGN STORMS (continued)



10-YEAR 24-HOUR RAINFALL (INCHES)



25-YEAR 24-HOUR RAINFALL (INCHES)

Source: USDA-SCS and U.S. Weather Bureau

Plate 5-20

OHM Corporation

COMPUTATION SHEET

Project Number _____ Page 4 of 4
Project Name _____
Project Location _____

Subject Dry/Decontamination Pad asphalt curb
Prepared By JJG Date 3-10-94
Checked By _____ Date _____

Cont'd from p. 2 of 2

add 6-in curb above grade

recalculate storage volumes:

Volume 1: $\frac{1}{2} bHh = \frac{1}{2}(50)(80)(.75) = 1500\ ft^3 \Rightarrow 11,220$ gal

less 600 gal

10620 gal

Volume 2: $\frac{1}{2}(50)(80)(1) = 2000\ ft^3 \Rightarrow 14,960$

$14,960 + 10620 = 25,580$ gal $<$ 29420 gal

Assume water treatment plant will maintain operation in event of storm to help drawdown water collected in pad; and/or add portable collection pools on site (12000 gal capacity) to act as storage pool. With these assumptions, 6-inch curb is adequate as well as a lower curb.

APPENDIX
C

APPENDIX C

WATER TREATMENT SYSTEM DESIGN FLOW ESTIMATES

OHM Corporation

COMPUTATION SHEET

Form No. 0048
Midwest Tech. Servs.
Rev. 08/89

Proj. No.	Client	Location	Subject
15444	LANTDIV	CAMP ALLEN, VA.	DEWATERING

Preparer's Initials	Date	Reviewer's Initials	Date	Approver's Initials	Date
D. FULTON	2-16-94	JJG	3-11-94		

BACKGROUND DATA:

BAKER PUMP TEST RESULTS (MR. JOHN BARRONE)

pumping rate	= 3.3 gpm	
drawdown in extraction well	= 7.5 feet	(static = 3 feet)
drawdown in observation well	= .5 feet	
distance to observation well	= 10 feet	
Saturated thickness (b)	= 20 feet	
Effective Porosity (ϕ_e)	= 30 %	
Radius of pumping well	= .166 feet	
Transmissivity	= 1,840 gpd/ft	
Storativity	= 1.9×10^{-3}	

[VOLUME OF WATER TO BE REMOVED (V_w):]

Area = 230 ft x 150 ft x 7 ft deep
ϕ_e = .30

$$V_w = 230' \times 150' \times 7' \times .30 \times 7.481 \frac{gals}{ft^3}$$

$$\approx 542{,}000 \text{ gallons}$$

[Maximum Flow Rate From Aquifer]

ASSUMPTIONS:
well Point diameter .083' = r (2" ϕ)
10-foot radius of influence

Formula from Driscoll, Groundwater and wells, 1987)

$$Q = \frac{K(H^2 - h^2)}{1055 \log (R/r)}$$

OHM Corporation

COMPUTATION SHEET

Form No. 0048
Midwest Tech. Servs.
Rev. 08/89

Proj. No.	Client	Location	Subject
15444	LANTDIV	CAMP ALLEN, VA	DEWATERING

Preparer's Initials	Date	Reviewer's Initials	Date	Approver's Initials	Date
D. FULTON	2-16-94	JJG	3-11-94		

K = 94.5 gpd/ft² = hydraulic Conductivity
H = 17 feet = saturated thickness before pumping (20'-3')
h = 10 feet = depth to water while pumping
R = 10 feet = radius of cone of depression
r = .083 feet = radius of well

$$Q = \frac{94.5\ (17^2 - 10^2)}{1055\ \log (10/.083)}$$

Q = 8 gpm

Assume a well efficiency of 75%

8 gpm x .75 = 6 gpm maximum well yield based on aquifer characteristics

[Maximum well Drawdown]

Assume specific capacity (Q/s) from pumping test

$$Q/s = \frac{3.3\ gpm}{7\ feet} = .47 \text{ gallons per minute per foot of drawdown.}$$

$$\frac{6\ gpm}{(Q/s)} = \frac{6\ gpm}{.47\ \frac{gpm}{ft}} = 12.76 \text{ feet or } \sim 13 \text{ feet of drawdown pumping @ 6 gpm}$$

David Fulton
C.P.G. #8187

APPENDIX
D

APPENDIX D

TREATMENT SYSTEM DESIGN CALCULATIONS

OHM Corporation

COMPUTATION SHEET

Project Number 15444-LAN-004 Page 1 of 2
Project Name Camp Allen, Area B
Project Location Norfolk, VA

Subject Water Treatment Calcs
Prepared By RAN Date 12/8/93
Checked By JJG Date 3/10/94

ASSUMPTIONS

1) 24-hour operation @ 75 gpm

2) HEXAVALENT CHROMIUM MUST BE CONVERTED TO TRIVALENT CHROMIUM BY ACID ADDITION PRIOR TO LIME ADDITION

3) 10-minute RETENTION IN MIXING TANKS

4) 2-hour RETENTION IN SETTLING TANK

5) 10,000 #'s CARBON CELLS WILL MAKE IT UNNECESSARY TO CHANGE-OUT CARBON DURING OPERATION (2 CELLS)

6) 4-hour RETENTION IN SURGE TANK

7) 2-hour RETENTION IN EFFLUENT TANK

VELOCITY IN INFLUENT AND EFFLUENT LINES

75 gpm = 0.167 cfs in 4" FLEXIBLE HOSE

$$V = \frac{0.167}{\frac{\pi (4/12)^2}{4}} = 1.91 \text{ fps} \quad \text{max}$$

TRANSFER TANK

- VOLUME @ 4-hour RETENTION AND 20 gpm

$(20 \text{ gpm})(60 \text{ min/hr})(4 \text{ hr})$

= 4,800 gal SAY 5,000 gal

STATE OF MISSOURI
RICHARD A. NOVAK
NUMBER E-20747
REGISTERED PROFESSIONAL ENGINEER

OHM Corporation

COMPUTATION SHEET

Project Number 15444-LAN-004 Page 2 of 2
Project Name Camp Allen, Area B
Project Location Norfolk, VA

Subject Water Treatment Calcs
Prepared By RAN Date 12/8/93
Checked By LJG Date 3/10/94

MIXING TANKS (2)

- VOLUME @ 10-minute RETENTION

(75 gpm)(10 min) = 750 gal EACH

SAY 1,000 gal EACH

SETTLING TANK

- VOLUME @ 2-hour RETENTION

(75 gpm)(60 min/hr)(2 hr)

= 9,000 gal SAY 10,000 gal

SURGE TANK

- VOLUME @ 4-hour RETENTION

(75 gpm)(60 min/hr)(4 hr)

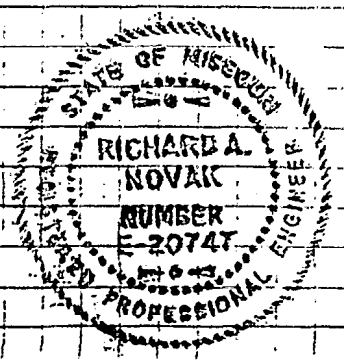
= 18,000 gal SAY 20,000 gal

EFFLUENT TANK

- VOLUME @ 2-hour RETENTION

(75 gpm)(60 min/hr)(2 hr)

= 9,000 gal SAY 10,000 gal



APPENDIX
E

APPENDIX E

MATERIALS LIST FOR WATER TREATMENT SYSTEM

APPENDIX E

MATERIALS LIST FOR WATER TREATMENT SYSTEM

Two 1,000-gallon mixing tanks

One 10,000-gallon settling tank

Two bag filters

Two 10,000-pound carbon cells with carbon

One 20,000-gallon surge tank

One 10,000-gallon effluent holding tank

One 5,000-gallon transfer tank (not in treatment area)

One 20-gpm submersible transfer pump (not in treatment area)

Two 10-gpm submersible transfer pumps (not in treatment area)

One 75-gpm positive displacement process pump

Two 75-gpm submersible process pumps

Two chemical metering pumps

Three flow meters

Ten 4-inch tees

Twenty 4-inch valves

Two 4-inch check valves

2,500 feet of 4-inch flexible hose

Sulfuric acid solution

Lime solution

Disposal drums

(If required, OHM can mobilize an additional carbon cell and/or a filter press to the site.)

APPENDIX
F

APPENDIX F

PROJECT SPECIFICATIONS

SECTION 01010

GENERAL PARAGRAPHS
02/91

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1.1 Federal Acquisition Register (FAR) 52.212-3 and 52.228-5

1.1.2 ARARs

An ARAR, as defined, is an environmental law, regulation, or guideline that is either "applicable" or "relevant and appropriate" to a remedial action. "Applicable" requirements are those cleanup standards, standards of control, and other environmental protection requirements, criteria, or limitations, promulgated under Federal or State laws that specifically address chemicals/contaminants of concerns, remedial actions, locations of remediation, or other circumstances at a CERCLA-regulated site. "Relevant and appropriate" requirements are those which address problems or situations sufficiently similar to those encountered at a CERCLA-regulated site that their use is well suited to the particular site (Section 121 of CERCLA, 42 U.S.C. Section 9621 and 40 CFR Section 300.68[i]). The Navy intends to comply with CERCLA standards and the following regulations shall be considered as ARARs for the site.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR, Part 1910

40 CFR, Parts 260 to 280

49 CFR, Parts 100 to 180

CORPS OF ENGINEERS

COE EM-385-1-1	1992 Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 241	1989 Safeguarding Construction, Alteration, and Demolition Operations

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

SW-846	Test Methods For Evaluating Solid Waste (Physical/Chemical Methods), 1986

1.2 SUBMITTALS

Submit the following in accordance with Section C of the Basic Contract. Copies of submittals shall be submitted to distribution as indicated.

1.2.1 SD-18, Administrative or Close-out Submittals

a. As-Built Records

b. Site Health and Safety Plan

c. Environmental Protection Plan

d. MIS Required Sorts (Network Analysis Diagram and Status Reports)

e. CQC Plan Addenda

f. Testing Laboratory Qualifications

g. CQC Meeting Minutes

h. Non-Compliance Check-off List

i. Test Results Summary Report

j. Daily Report to Inspector/CQC Report

k. Submittal Status Log

l. Permits

m. Contractor's Closeout Report

1.3 GENERAL INTENTION

It is the declared and acknowledged intention and meaning to provide and secure a removal action for soils and debris at Camp Allen Landfill, Area B, Naval Station, Norfolk, Virginia, complete and ready for use.

1.4 GENERAL DESCRIPTION

This work includes providing all labor, supervision, tools, materials, equipment and transportation necessary to remove and dispose of contaminated soil, to the clean up levels defined herein, and debris and construction rubble at Camp Allen Landfill, Area B, Naval Station, Norfolk. Components of this project include: excavation of contaminated soil and debris buried in trenches; backfilling with clean fill; control, collection and treatment of contaminated water and Investigative Derived Wastes (IDW) liquids; discharge of treated water to sanitary sewer; transportation and disposal of contaminated soil and debris in a RCRA Subtitle C landfill; excavation of construction rubble; transportation and disposal of construction rubble in a construction waste landfill; site restoration; wetlands restoration; and other related work.

1.5 DESCRIPTION OF CONTAMINANTS PRESENT

Camp Allen Landfill, Area B, contains debris from a fire at the adjacent salvage yard. This debris was reportedly disposed of in trench and fill operations toward the north end of Area B. Construction rubble, including concrete and rebar, has been disposed on the surface along the edge of the pond at Area B.

Area B is presently being investigated as part of an ongoing remedial investigation/feasibility study. A geophysical investigation was conducted and supported the reported disposal of the Salvage Yard debris, and also located an area of buried metallic objects at the southeastern corner of Area B and towards the middle of Area B.

The analytical work performed to date has identified the presence in the subsurface soils of volatile organic compounds (VOCs), including trichloroethene, 1,2-dichloroethene, toluene, ethylbenzene and xylenes, along with polychlorinated biphenyls (PCBs) below 10 ppm. The results of the analyses for TCLP and RCRA characteristics of three soil borings in the areas of contamination are attached at the end of this section. Identified contaminants in the shallow groundwater at the site include trichloroethene, 1,2-dichloroethene, vinyl chloride and benzene. Solids produced during groundwater sampling were contaminated with the metals arsenic, barium, cadmium, chromium, lead and zinc. The above list of contaminants is not all inclusive.

1.6 LOCATION

The work shall be located at Camp Allen Landfill, Area B, Naval Station, Norfolk, Virginia, approximately as shown.

1.7 PROJECT INFORMATION

1.7.1 Drawings, Maps and Specifications

Four sets of contract drawings, maps and specifications will be furnished to the Contractor, except applicable publications incorporated into the technical provisions by reference. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications.

NAVFAC Drawing No.	Title
4267040	Vicinity and Location Maps, and General Notes
4267041	Site Plan
4267042	Detailed Site Plan
4267043	Wetlands Reestablishment Plan
4267044	Details

1.7.2 Reference Reports

The following reference reports are provided for reference and is intended only to show the existing conditions. The report and drawings are the property of the Government and shall not be used for any purpose other than that intended by the specification.

Report

A. "Final Engineering Evaluation/Cost Analysis For Camp Allen Landfill, Area B, Naval Station, Norfolk, Virginia." Baker Environmental, Inc., dated August 11, 1993.

B. "Draft Final Camp Allen Remedial Investigation Report," Baker Environmental, Inc., dated August 1993.

1.7.3 Soil Borings and Well Logs

The report entitled "Draft Remedial Investigation Report, Camp Allen Landfill, Norfolk Naval Base (March 1993)" contains soil boring and well logs. Boring logs are presented at the end of this specification section. The boring logs depict subsurface conditions only at the specific locations and dates indicated. Subsurface conditions and water levels at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the conditions at these locations. Borings were logged in the field. Samples were examined and visually classified in approximate accordance with ASTM D 2488.

1.7.4 Investigation-Derived Waste Drums

A list of Investigation-Derived Waste Drums is presented at the end of this section. The list presents row numbers as labeled at the site, quantity per row, and waste phase (liquid or solid). Liquid wastes are designated as potentially hazardous (decontamination fluids) or are monitoring well purge water. Solid wastes are designated as personal protective equipment or are drill cuttings from monitoring well installation and soil borings. Wastes have been visually classified.

1.8 PROJECT SCHEDULE AND TIME CONSTRAINTS

The Contractor shall be required to (a) commence work under this contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 180 calendar days after the required commencement of work. All intrusive work requiring Level B or Level C protective equipment shall be conducted between the dates of June 17, 1994 and September 2, 1994. The time stated for completion shall include final cleanup of the premises. The time stated for completion does not include the maintenance period for the seed and wetlands plantings. Submittals required after construction completion shall be submitted not later than 30 days after construction completion.

1.9 SAFETY PROGRAM

In addition to safety requirements in the Basic Contract, the Contractor shall implement a safety program conforming to the requirements of Federal, state, and local laws, rules and regulations. The program shall include, but is not limited to, the following:

a. Occupational Safety and Health Standards

b. COE EM-385-1-1

c. Contract Clause entitled "Accident Prevention." In this clause, the date of COE EM-385-1-1 should be 1 October 1992.

d. NFPA 241

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 FACILITIES AND SERVICES

3.1.1 Availability of Utilities Services

a. The Government shall supply potable and non-potable water required to perform work to the Contractor. The water source location is the fire hydrant near the site. Work shall be coordinated with the Navy Public Works Center (PWC) (Joe Honore, 804-445-4019). The Contractor shall provide all piping, hoses, pumps, and connections to transport water to the desired locations on site. The Contractor shall also provide a backflow-prevention device and metered connections to the water source. The Contractor shall be responsible for payment arrangements with PWC.

b. The Government shall supply reasonable amounts of electricity to the Contractor. (3) 50 KVa bank transformers on a pole supplying 208Y120 power are located in the field within the boundaries of the site as indicated. The Contractor shall provide all equipment and labor necessary to connect, convert, and transfer the utilities to the work. The Contractor shall make connections, including providing meters, and make disconnections.

c. The Contractor shall not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer and the ROICC representative giving 2 days advance notice when such operation is required.

d. The Contractor shall contact Navy Public Works Center, Brenda Perry (804-444-8000) in writing to obtain telephone connection and payment information. Cost for telephone connection will be paid by the Contractor. The Contractor shall provide all equipment and labor necessary to connect the telephone service to the site. The Contractor shall make arrangements for connections and disconnections and payments.

3.1.2 Contractor's Storage Areas

The clause of the Contract Clauses entitled "Operations and Storage Areas" applies.

3.1.2.1 Storage in Existing Buildings

Storage in existing buildings will not be allowed.

3.1.2.2 Open Site Storage Size and Location

The open site available for storage shall be confined to the areas indicated on the contract drawings.

3.1.3 Trailers, Storage, and Temporary Buildings

Locate these where directed and within the indicated operations area. Trailers or storage buildings will be permitted, where space is available subject to the approval of the Navy Technical Representative/ROICC. The trailers or storage buildings shall be suitably painted and kept in a good state of repair. Failure of the Contractor to Maintain the trailers or storage buildings in good condition will be considered sufficient reason to require their removal.

3.1.3.1 Storage and Office Trailers

Provide a trailer of sufficient size for an office trailer work area and floor area for the exclusive use of the Contractor's Quality Control Representative. Also provide room in the same trailer for the Contractor Quality Control Records. Provide the Contractor's Quality Control representative with a 4-foot by 8-foot plan table, an standard size office desk and chair, and telephone service. Contractor quality control records shall be filed in the office and available at all times to the Government.

Trailers must meet state law requirements and must be in good condition.

a. Trailers shall be lockable and shall be locked when not in use.

b. Trailers shall have a sign in lower left hand corner of left door of trailer with the following information: company name, address, registration number of trailer or vehicle identification number, location on base, duration of contract or stay on-base, contract number, local on-base phone number, off base phone number of main office, and emergency recall person and phone number.

3.1.4 Availability of Weigh Scales

Weigh scales located at the Salvage Yard next to the site will be available at no charge for the Contractor's use during normal working hours. The Contractor will receive an unofficial weigh ticket from the scale operator. The Contractor must coordinate use of the scales directly with the Defense Reutilization and Marketing Office (DRMO) that runs the Salvage Yard. (The phone number is 804-444-5600.) The Contractor must coordinate the access and egress route for the use of the scale.

3.2 RESTRICTIONS ON OPERATIONS

3.2.1 Scheduling

The Contractor shall schedule the work as to cause the least amount of interference with station operations. Work schedules shall be subject to the approval of the Officer in Charge of Construction. Permission to interrupt station roads shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption.

3.2.1.1 Special Scheduling Requirements

a. The Naval Base Norfolk will remain in operation during the entire construction period and the Contractor shall conduct his operations so as to cause the least possible interference with the normal operations of the activity.

b. Notify the ROICC 48 hours prior to starting excavation work.

c. Maintenance of Traffic and Protection: The contractor shall conduct his construction operations in and adjacent to existing paved areas so as to create the least possible inconvenience to the traveling public. Except as specified otherwise, all existing traffic lanes shall be kept open for unobstructed traffic flow. Where new construction required breaking up existing pavement, and all traffic lanes cannot be kept open, one traffic lane of roadway may be temporarily closed. The contractor shall notify the Contracting Officer a minimum of 15 days in advance of each proposed closing date for all roadways. After reopening, patches in the traffic lanes shall be maintained as required to prevent bumps and depressions until the final paved surface is applied. Temporary patches shall be bituminous concrete.

d. Barricades and Warning Signs: The contractor shall provide, erect, and maintain all necessary lighted barricades, danger signals, detour signs, and other warning signs; provide a sufficient number of watch men; and take all necessary precautions for the protection of the work, the safety of the public, and of the contractors personnel.

e. Utility Interruptions: Permission to interrupt any utility service shall be requested in writing at least 15 days in advance and approval of the Navy Technical Representative/ROICC shall be received before any service is interrupted. Interruptions of utility services will only be allowed when they cause minimal or no interference with the operations of the activity, unless specified otherwise. Unless otherwise directed by the Contracting Officer, such interruptions will be permitted only after regular working hours or on the weekends; anticipated costs shall be included in the bid. Prior to requesting any outages, the contractor shall have at the job site, all materials and equipment required to perform the work involved and shall demonstrate to the Navy Technical Representative/ROICC , the ability to complete the work and restore the service within the outage period specified or approved.

3.2.2 Regular Work Hours

The regular work hours for Naval Base, Norfolk are 0730 to 1530.

3.2.3 Work Outside Regular Hours

If the Contractor desires to carry on work outside regular hours or on Saturdays, Sundays, or holidays, the Contractor shall submit an application to the Officer in Charge of Construction/Navy Technical Representative. The Contractor shall allow ample time to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. At night, the Contractor shall light the different parts of the work in an approved manner.

3.2.4 Security Requirements

No employee or representative of the Contractor will be admitted to the work site without satisfactory proof of United States citizenship.

3.2.4.1 Extraordinary Security Requirements

The clause of the Contract Clauses entitled "Identification of Employees" and the following apply:

a. Contractor Registration: Register with the Base Policy Truck Investigation Team, located at the Gate 4 Truck Control Station, Naval Air Station, Norfolk, Virginia 23511-5000, telephone (804) 445-1464.

b. Equipment Markings: Equipment owned or rented by the company will have the company name painted or stenciled on the equipment in a conspicuous location. Rented equipment is to be conspicuously marked with a tag showing who rented it. Register the equipment with the truck investigation team.

c. Procedure Information: For additional information regarding registration procedures, contact the Officer in Charge of Contractors at (804) 445-1464 or Detective Sellars at (804) 445-1463.

3.3 ACTIONS REQUIRED OF THE CONTRACTOR

3.3.1 Location of Underground Facilities

Verify the elevation and location of existing piping, utilities, and any type of underground obstruction not indicated or specified to be removed but indicated in locations to be traversed during excavation.

3.3.2 Station Permits

Obtain station permits pursuant to paragraph entitled "Station Regulations." Permits are required for, but not necessarily limited to, excavation, welding, and burning. Allow 7 calendar days for processing of the applications.

3.3.3 Storm Protection

If a warning of gale force winds is issued, take precautions to minimize any danger to persons, and protect the work and any nearby Government property. Precautions shall include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work if storms of lesser intensity pose a threat to the work or any nearby Government property.

3.4 PUBLIC RELEASE OF INFORMATION

a. The Contractor shall not publicly disclose any information concerning any aspect of the materials or services related to this delivery order without the prior written approval of the Contracting Officer.

b. The Contractor shall insert the substance of clause "(a)" of this paragraph in each subcontract and purchase order relating to the project.

3.5 SUBMITTALS FROM BASIC CONTRACT

3.5.1 As-Built Records

Maintain one sepia and one set of full size as-built drawings in accordance with the Basic Contract Section C, Part 2.0 "As-Builts." Upon completion of the project submit the certified drawings to the NTR.

3.5.2 Site Health and Safety Plan

Within 20 days of issue delivery order, prepare and submit to the NTR a Site Health and Safety Plan which complies with the Basic Contract Section C, Part 3.0 "Health and Safety." The plan shall include an Air Sampling program designed to meet the requirements of OSHA Standard 29 CFR 1910.

3.5.3 Environmental Protection Plan

Within 14 days of issue of delivery order, prepare and submit an environmental protection plan which complies with the Basic Contract Section C, Part 4.0 "Environmental Requirements", and with Section 01560, "Environmental Protection", of this specification.

3.5.4 MIS Required Sorts

The MIS system shall be a system able to provide as a minimum the activities in sorts or groups as specified in Delivery Order # 0001.

3.5.4.1 Network Analysis Diagram

Within 10 days of issuance of the delivery order, submit a network analysis diagram which complies with Delivery Order # 0001.

3.5.4.2 Status Reports

All status reports shall comply with the Delivery Order # 0001. Submit a Technical Progress Report, Cost Performance Report, Modification Log, Time-Scaled Logic Diagram, Government Materials Tracking Report, Variance Analysis Report, and Waste Materials Report. Submit the first delivery order status report approximately 30 days after issuance of the delivery order. Thereafter, submit status reports every 16 days. Status report periods shall be consistent with the invoice reporting periods.

3.5.5 CQC Plan Addenda

Within 20 days of issuance of the delivery order, submit a CQC Plan Addenda which complies with Section C, Part 6.0 of the Basic Contract.

3.5.6 Testing Laboratory Qualification

Within 20 days of issuance of the delivery order, submit Qualifications of each Laboratory which will be used. This submittal must comply with Section C, Part 6.0 of the Basic Contract.

3.5.7 CQC Meeting Minutes

The CQC Representative shall document all CQC meetings by delivering copies of the minutes to all attendees and the NTR within 3 calendar days after each CQC meeting. The submittals shall comply with Section C, Part 6.0 of the Basic Contract. All CQC meeting minutes shall be approved by all attendees before final record of meeting is made.

3.5.8 Non-Compliance Checkoff List

The CQC Representative shall deliver a copy of the checkoff list of non-complying work items to the NTR on a monthly basis in accordance with Section C, 6.0 of the Basic Contract.

3.5.9 Test Results Summary Report

A summary report of all field tests containing both "required" and "actual" results plus "passed" or "failed" for conforming, non-conforming and repeating test results shall be submitted to the NTR at the end of each month in accordance with Section C, Part 6.0 of the Basic Contract.

3.5.10 Daily Report to Inspector (DRI)/CQC Report

The DRI/CQC shall be prepared and submitted by the CQC Representative to the NTR every day work is performed, material is delivered, direction is pending, or a labor force is present in accordance with Section C, Part 6.0 of the Basic Contract.

3.5.11 Submittal Status Log

The CQC Representative shall submit a completed Submittal Status Log to document quality control for materials, inspection and testing in accordance with Section C, Part 6.0 of the Basic Contract. The Submittal Status Log shall be continually updated, maintained on-site and available

for Government review at any time.

3.5.12 Permits

Within 20 days of issuance of the delivery order, submit draft copies of the following permits required for on-site activities:

a. Excavation Permit; from the Public Works Officer, Utilities Division

b. Welding and Burning Permit; from the Base Fire Marshall

3.5.13 Contractor's Closeout Report

Submit upon completion of the project. This report shall include: Introduction, Summary of Action, Final Health and Safety Report, Summary of Record Documents, Field Changes and Contract Modification, Final Documents, Summary of Chemical and Geotechnical Testing, Offsite Disposition of Materials, and QC Summary Report. The report shall conform to 40 CFR 300.165 regarding OSC report format for removal actions. The report shall address all details requested by 40 CFR 300.165(c)(1)-(4).

-- End of Section --

SECTION 01560

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910-SUBPART G	Occupational Health and Environmental Control
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
49 CFR 178	Shipping Container Specification

CORPS OF ENGINEERS (COE)

COE EP-1165-2-304	1976 Flood Plain Regulations for Flood Plain Management

NAVAL ENERGY & ENVIRONMENTAL SUPPORT ACTIVITY (NEESA)

NEESA PS-015	1980 Disposal of Lead-Acid Battery Electrolyte, April 18

VIRGINIA DIVISION OF SOIL AND WATER CONSERVATION COMMISSION (VSWCC)

VSWCC VESCH	1992 Virginia Erosion and Sediment Control Handbook

1.2 DEFINITIONS

1.2.1 Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except hazardous waste as defined in paragraph entitled "Hazardous Waste,"

resulting from industrial, commercial, and agricultural operations and from community activities.

1.2.3 Rubbish

Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.

1.2.4 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.

1.2.5 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, organic chemicals, and spent products which serve no purpose.

1.2.6 Sanitary Wastes

1.2.6.1 Sewage

Wastes characterized as domestic sanitary sewage.

1.2.6.2 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2.7 Hazardous Waste

Hazardous substances as defined in 40 CFR 261 or as defined by applicable state and local regulations.

1.2.8 Oily Waste

Petroleum products and bituminous materials.

1.3 SUBMITTALS

Submit the following in accordance with Attachment 7 of the Basic Contract.

1.3.1 SD-18, Records

1.3.1.1 Solid waste disposal permit

Submit one copy of a state and local permit or license showing such agencies' approval of the disposal plan.

1.3.1.2 Disposal permit for hazardous waste

Submit a copy of the applicable EPA and state permits or licenses for transportation, treatment, storage, and disposal of hazardous waste by permitted facilities.

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, state, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Land Resources

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officers permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attach ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.

3.1.1.1 Protection

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed.

3.1.1.2 Replacement

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before replacement.

3.1.1.3 Temporary Construction

Remove traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction. Grade temporary roads, parking areas, and similar temporarily used areas to conform with surrounding contours.

3.1.2 Water Resources

3.1.2.1 Oily Wastes

Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Surround all temporary fuel oil or petroleum storage tanks with a temporary earth berm of sufficient size and strength to contain the contents of the tanks in the event of leakage or spillage.

3.1.3 Fish and Wildlife Resources

Do not disturb fish and wildlife. Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as indicated or specified.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work.

3.3 EROSION AND SEDIMENT CONTROL MEASURES

3.3.1 Burnoff

Burnoff of the ground cover is not permitted.

3.3.2 Protection of Erodible Soils

Immediately finish the earthwork brought to a final grade, as indicated or specified. Immediately protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

3.3.3 Temporary Protection of Erodible Soils

Use the following methods to prevent erosion and control sedimentation:

3.3.3.1 Mechanical Retardation and Control of Runoff

Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses. A collection system to collect runoff from stockpile areas will be constructed. Runoff from the contaminated stockpile will be treated on-site.

3.3.3.2 Vegetation and Mulch

Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by

hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

a. Seeding: Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to reestablish a suitable stand of grass. The seeding operation shall be as specified in Section 01561, "Erosion and Sediment Control".

3.3.4 General Work Requirements

Provide and maintain erosion control measures in accordance with the VSWCC VESCH and Section 01561, "Erosion and Sediment Control".

3.4 CONTROL AND DISPOSAL OF SOLID AND SANITARY WASTES

Pick up solid wastes, and place in containers which are regularly emptied. Do not prepare, cook, or dispose of food on the project site. Prevent contamination of the site of other areas when handling and disposing of wastes. On completion, leave the areas clean. Control and dispose of waste.

3.4.1 Disposal of Rubbish and Debris

Dispose of rubbish and debris in accordance with the requirements specified.

3.4.1.1 Removal From Government Property

Remove and dispose rubbish and debris from Government property.

3.4.2 Sewage, Odor, and Pest Control

Dispose of sewage through connection to a station sanitary sewage system. Where such system is not available, use chemical toilets or comparably effective units, and periodically empty wastes into a station sanitary sewage system, or construct and maintain an approved type of adequate sanitary convenience for the use of persons employed on the work in accordance with the General Paragraphs titled, "SANITATION." Include provisions for pest control and elimination of odors.

3.5 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.5.1 Hazardous Type Waste

Store hazardous waste in approved containers (49 CFR 178) properly labeled to identify the type of waste and the date the container was filled. Remove the containers from the project site, and store and dispose of hazardous waste in accordance with 40 CFR 263 and 40 CFR 264. For oil and hazardous material spills, notify the Contracting Officer immediately.

3.5.2 Petroleum Products

Conduct the fueling and lubricating of equipment and motor vehicles to protect against spills and evaporation. Dispose of lubricants to be discarded and all excess oil.

3.5.3 Lead-Acid Battery Electrolyte

Dispose of electrolyte solution from lead-acid batteries. Do not dump electrolyte onto the ground or into storm drains or sanitary sewers without first neutralizing the electrolyte. Use one of the following alternatives for disposal of waste electrolyte:

a. An industrial waste treatment plant, if available and approved by the Contracting Officer for neutralizing and disposing of battery acid electrolyte.

b. Transport the electrolyte to a state-approved hazardous waste disposal site. The method of transportation and equipment shall comply with applicable Federal and state regulations.

c. Use an EPA-approved existing tank located on station or construct a neutralization tank. The neutralization process shall be in accordance with NEESA PS-015.

3.5.4 Equipment (Hazardous Material)

Make available to the Contracting Officer or the Contracting Officer's Representative, one complete set of the proper personal protective equipment as required herein for entry into the inspection of the hazardous control area. Provide equivalent training to the Contracting Officer or a designated representative in the use of the required personal protective equipment as that provided to Contractor employees. Provide manufacturer's certificate of compliance for all equipment required.

3.5.4.1 Protective Clothing

Provide personnel exposed to the hazardous area with proper protective whole body clothing, head coverings, gloves, and foot coverings.

3.6 DUST CONTROL

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars except as otherwise specified. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster.

3.7 HAZARDOUS WASTE GENERATION

Handle generated hazardous waste in accordance with 40 CFR 262.

3.8 HAZARDOUS WASTE DISPOSAL

Dispose of hazardous waste in accordance with 40 CFR 263 and 40 CFR 264.

-- End of Section --

SECTION 01561

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

FEDERAL SPECIFICATIONS (FS)

FS O-F-241	(Rev. D) Fertilizers; Mixed, Commercial

U.S. ARMY CORPS OF ENGINEERS (CW) PUBLICATIONS

CW 02215	1977 Plastic Filter Fabric

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M182	1960 (Rev. 1982) Burlap Cloth Made From Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C33	1990 Concrete Aggregate
ASTM D98	1987 Calcium Chloride
ASTM D1682	1964 (Rev. 1985) Breaking Load and Elongation of Textile Fabrics
ASTM D3786	1987 Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

VDOT RBS	1991 Road and Bridge Specifications

VIRGINIA SOIL AND WATER CONSERVATION COMMISSION (VSWCC)

VSWCC	1992 Virginia Erosion and Sediment Control Handbook

1.2 DESCRIPTION OF WORK

The work includes the provision of temporary erosion control measures to prevent the pollution of air, water, and land within the project limits and in areas outside the project limits where work is accomplished in

conjunction with the project. Installation of temporary erosion control features shall be coordinated with the construction of permanent erosion control features to assure effective and continuous control of erosion and pollution. Provide and maintain erosion control measures in accordance with VSWCC VESCH.

1.3 SUBMITTALS

Submit the following:

1.3.1 SD-02, Manufacturer's Catalog Data

a. Silt Fence

b. Dust Suppressors

PART 2 PRODUCTS

2.1 SILT FENCE

2.1.1 Standard Catalog Product

A manufacturer's standard catalog product for a preassembled silt fence may be provided in lieu of the indicated silt fence except that the filter fabric shall be as specified, and the height of the structure shall be as indicated.

2.1.2 Posts

2 inch by 4 inch wood posts. Posts shall be a minimum of 12 inches long.

2.1.3 Filter Fabric

A woven or nonwoven polypropylene, nylon, or polyester containing stabilizers and/or inhibitors to make the fabric resistant to deterioration from ultraviolet, and with the following properties:

a. Minimum grab tensile strength (ASTM D1682)	100 pounds
b. Minimum grab elongation (ASTM D1682)	25 percent
c. Minimum mullen burst strength (ASTM D3786)	210 psi
d. E.O.S. (CW 02215)	20-100

2.2 TEMPORARY SEEDING

2.2.1 Seed

State certified seed of the latest season's crop. Provide seed as specified in Part 3 - Execution.

2.2.2 Fertilizer

FS O-F-241, Type I, Class 2, with 10 percent nitrogen, 20 percent available phosphoric acid, and 10 percent potash.

2.2.3 Mulch

Hay or straw. Provide in an air dried condition for placement with commercial mulch blowing equipment.

PART 3 EXECUTION

3.1 SILT FENCE

Install posts a maximum of 6 feet on center, and at an angle between 2 degrees and 20 degrees towards the potential silt load area. The height of the silt fence shall not exceed 36 inches. Do not attach filter fabric to existing trees. Secure filter fabric to the post using staples, tie wire, or hog rings. Attach filter fabric as shown in the drawings. Splice filter fabric at support pole using a 6 inch overlap and securely seal. Top of the filter fabric shall have a 1 inch tuck or a reinforced top end section.

3.2 TEMPORARY SEEDING

Within 48 hours after attaining the grading increment specified herein, provide seed, fertilizer, and mulch on graded areas when any of the following conditions occur:

a. Grading operations stop for an anticipated duration of 30 days or more.

b. Provide on the slopes of cuts and fill slopes for every 5 foot increment of vertical height of the cut or fill.

c. When it is impossible or impractical to bring an area to finish so that permanent seeding operations can be performed without serious disturbance from additional grading.

d. When an immediate cover is required to minimize erosion, or when erosion has occurred.

e. Provide on erosion control devices constructed using soil materials.

3.2.1 General

Loosen subgrade to a minimum depth of 4 inches. Uniformly apply the seed, fertilizer, and mulch at the specified application rates. Roll the seeded area after applying seed and fertilizer. Do not seed or fertilize when the Contracting Officer determines conditions are unfavorable. Provide water to promote turf growth.

3.2.2 Seed

Provide seed type and quantity (pounds per acre) as follows:

SEED TYPE	Nov 16 - Jan 31	Feb 01 - Apr 15 Oct 16 - Nov 15	Apr 16 - Oct 15
Hybrid Fescue	200	200	
Red Top	6	6	6
Bermuda	45(unhulled)	45(unhulled)	100(hulled)

3.2.3 Fertilizer

Apply at the rate of 1000 pounds per acre.

3.2.4 Mulch

Spread mulch at the rate of 1.5 tons per acre and anchor by crimping mulch with a disc.

3.3 MAINTENANCE AND INSPECTION

Inspect erosion control devices after each rainfall and daily during prolonged rainfall. Remove sediment deposits after each rainfall or when sediment reaches approximately one-half the barrier height. Immediately repair damaged erosion control devices and damaged areas around and underneath the devices. Maintain erosion control devices to assure continued performance of their intended function. Modify the Contractor furnished erosion control plan as required to control problem areas noticed after each inspection.

3.4 CLEAN UP

At the completion of the job, or when directed or approved by the Contracting Officer, erosion control devices shall be removed. erosion control devices and areas immediately adjacent to the device shall be filled (where applicable), shaped to drain and to blend into the surrounding contours, and finished. Erosion control devices may remain in place when approved by the Contracting Officer.

-- End of Section --

SECTION 02050

DEMOLITION AND REMOVAL

PART 1 GENERAL

1.1 REFERENCES

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A10.6	1983 Demolition Operations - Safety Requirements

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261	Identification and Listing of Hazardous Waste

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

SW-846	(1986) Test Methods for Evaluating Solid Waste (Physical/Chemical Methods)

1.2 DEFINITIONS

1.2.1 Uncontaminated Construction Rubble

Material adjacent to the pond that does not exceed the toxicity characteristic waste standards of 40 CFR 261 based on the Toxicity Characteristic Leaching Procedure (TCLP) and the RCRA characteristics of ignitability, corrosivity, and reactivity as provided in 40 CFR 261.

1.3 SUBMITTALS

Submit the following:

1.3.1 SD-08, Statements

a. Demolition plan

Submit proposed demolition and removal procedures to the Contracting Officer and Navy Technical Representative for approval before work is started.

1.3.1.1 Required Data

Demolition plan shall include procedures for removal and disposition of materials, coordination with other work in progress, a detailed description of methods and equipment to be used for each operation and the sequence of operations.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," safety requirements shall conform with ANSI A10.6, "Demolition Operations - Safety Requirements."

1.4.1 Notifications

Furnish timely notification of demolition and renovation projects to Federal, state, regional, and local authorities in accordance with 40 CFR 61-SUBPART M. Notify the Regional Office of the United States Environmental Protection Agency (USEPA), state's environmental protection agency, and the Contracting Officer in writing 10 days prior to the commencement of work in accordance with 40 CFR 61-SUBPART M.

1.5 DUST CONTROL

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.6.2 Existing Work

Protect existing work which is to remain in place, be reused, or remain the property of the Government. Repair items which are to remain and which are damaged during performance of the work to their original condition, or replace with new. Provide new supports and reinforcement for existing construction weakened by demolition or removal work. Repairs, reinforcement, or structural replacement must have Contracting Officer approval.

1.6.3 Trees

Conform to Section 01560, "Environmental Protection," for protection of natural resources.

1.6.4 Facilities

Protect electrical and mechanical services and utilities.

1.7 BURNING

Burning will not be permitted.

1.8 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Monitoring Well

Remove existing monitoring wells GW-4, GW-5, B-MW5B, and Well 5 as indicated. Remove the surface metal housings and extract the PVC casings.

3.1.2 Uncontaminated Construction Rubble

Construction rubble adjacent to the pond that is determined to be uncontaminated shall be loaded onto trucks or roll-off containers and transported to a Virginia-approved construction debris disposal facility permitted to accept such materials.

3.2 TESTING REQUIREMENTS FOR DISPOSAL OF CONSTRUCTION RUBBLE

The Contractor shall conduct sampling and analysis in accordance with an approved Sampling and Analysis Plan. A minimum of one composite sample shall be analyzed for RCRA characterization and full TCLP analytes in accordance with test methods contained in EPA SW-846.

3.3 FILLING

Fill holes and other hazardous openings in accordance with Section 02220, "General Excavation, Filling and Backfilling". Holes from extracted monitoring wells shall be filled with cement grout to existing grade elevation.

3.4 DISPOSITION OF MATERIAL

3.4.1 Title to Materials

Except where specified in other sections, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition and removal procedures, and authorization by the Contracting Officer to begin demolition. The Government will not be responsible for the condition or loss of, or damage to, such property after notice to proceed. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.5 CLEANUP

3.5.1 Debris and Rubbish

Remove and transport debris and rubbish in a manner that will prevent spillage on pavements, streets or adjacent areas. Clean up spillage from pavements, streets and adjacent areas. Conform to other applicable requirements under Section 01560, "Environmental Protection".

-- End of Section --

SECTION 02220

GENERAL EXCAVATION, FILLING, AND BACKFILLING
06/92

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	1990 Concrete Aggregate
ASTM C 136	1984 (Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 698	1978 (R 1990) Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop
ASTM D 1140	1954 (R 1990) Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
ASTM D 1556	1990 Density of Soil in Place by the Sand-Cone Method
ASTM D 1557	1978 (R 1990) Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop
ASTM D 2487	1990 Classification of Soils for Engineering Purposes
ASTM D 2922	1981 (R 1990) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	1988 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	1984 Liquid Limit, Plastic Limit, and Plasticity Index of Soils

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600	1987 Installation of Ductile-Iron Water Mains and Their Appurtenances

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261	Identification and Listing of Hazardous Waste

CORPS OF ENGINEERS (COE)

COE EM-385-1-1	1992 Safety and Health Requirements Manual

FEDERAL SPECIFICATIONS (FS)

FS O-F-241 (Rev. D)	Fertilizer, Mixed, Commercial

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

SW-846	(1986) Test Methods for Evaluating Solid Waste (Physical/Chemical Methods)

1.2 DEFINITIONS

1.2.1 Cohesive Materials

Materials ASTM D 2487 classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

1.2.2 Cohesionless Materials

Materials ASTM D 2487 classified as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.2.3 Select Material

ASTM D 2487, classification GW, GP, SW, SP with a maximum of 10 percent by weight passing ASTM D 1140.

1.2.4 Contaminated Materials/Cleanup Levels

Materials having contaminant concentrations, in parts per million, greater than the following as determined by EPA Methods 8010, and 8080.

PCBs	10.0
Trichloroethene	47.0
1,2-Dichloroethene	70.0
Vinyl Chloride	0.9

1.3 SUBMITTALS

Submit the following in accordance with Section C, Part 7.0 of the Basic Contract.

1.3.1 SD-11, Factory Test Reports

Certification that imported material is free of contamination.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

Free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.1 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.2 Backfill and Fill Material

ASTM D 2487, classification GC, or SC with a maximum ASTM D 4318 liquid limit of 35, maximum ASTM D 4318 plasticity index of 12, and a maximum of 25 percent by weight passing ASTM D 1140, No. 200 sieve, or ASTM D 2487, classification GW, GP, SW, SP with a maximum of 10 percent by weight passing ASTM D 1140.

2.1.2.1 Backfill and Fill Material (Government Borrow Area)

Material will be available for use on this contract only from the Government borrow area located between the Willoughby Housing Area and Interstate 64 at a cost of $3.34 per cubic yard. The Contractor shall comply with all rules and regulations required by the Public Works Center (PWC) in the operation of Government borrow area. Contractor shall provide the necessary personnel and equipment to load the select material into Contractor-furnished trucks from 9:00 am to 3:00 pm, Monday through Friday (excluding Federal holidays). Any exceptions to the above specified hours shall be coordinated through the Contracting Officer to the Commanding Officer, Navy Public Works Center. When Government borrow material is required, submit a written schedule weekly to the Contracting Officer, a minimum of two weeks in advance, with the following information:

a. A daily estimate of the anticipated number of trucks, with each truck capacity in cubic yards.

b. An estimated arrival time at the Government borrow area for each truck.

Information similar to that specified above in the weekly schedule may be forwarded to the Naval Base Police through the Contracting Officer to allow entrance of Contractor's truck filled with select material through Gate 4.

Measurement of material will be by the cubic yard. The cubic yard capacity for each truck will initially be measured by PWC and will be the basis for payment thereafter. The Contractor shall set up an account with the Navy Public Works Center, Comtroller Department (Code 150), with the initial contact provided by the Contracting Officer. It is anticipated an initial deposit of approximately 20 percent of the total cost of Government furnished select material required for the job, will be required. After the initial contact, the billing process will be directed between the Contractor and the PWC Controller Department. The Government will be checking the Contractor's account against the running total of select material reported on the daily report to verify all select material from the Government borrow area is being used on this job only. A trip ticket will be issued by PWC at the Government borrow area for each truck, indicating Contractors trucking company name, date, time, and amount of select material loaded onto the truck. When the truck arrives at the job site, each trip ticket shall be initialed by the Government inspector prior to dumping select material. Each trip ticket shall be submitted daily to the Contracting Officer, attached to the Contractor's daily report. The daily report shall keep a running total of Government furnished select material provided to the job site.

2.1.3 Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7. Obtain topsoil from sources outside of Government property.

2.2 IMPORTED MATERIAL

All imported materials required to accomplish the work under these Contract Documents are subject to the following requirements:

a. The Contractor must certify that all imported material is free from contamination. Certification shall be submitted to the Navy's Technical Representative/ROICC. The source of all imported soil materials must be approved by the Government. Representative samples of imported soil materials must not be hazardous by definition or specific listing under Resource Conservation Recovery Act (RCRA) or Toxic Substance Control Act (TSCA) regulations. The frequency, type, and number of tests and detection limits for analysis of hazardous constituents shall be proposed by the Contractor for approval by the Government.

b. All tests necessary for the Contractor to locate an acceptable source of imported material shall be made by the Contractor. Certification that the material conforms to the specification requirements along with copies of the test results from a qualified commercial testing laboratory shall be submitted to the Navy's Technical Representative for approval at least 10 days before the material is required for use. Samples shall be representative and be clearly marked to show the source of the material and the

intended use on the project. Sampling of the material source shall be done by the Contractor in accordance with ASTM D 75. The Contractor shall notify the Navy's Technical Representative at least 24 hours prior to sampling. The Navy's Technical Representative may at the Navy Technical Representative's option, observe the sampling procedures. Tentative acceptance of the material source shall be based on a inspection of the source by the Navy's Technical Representative and/or the certified test results submitted by the Contractor to the Navy's Technical Representative at the Navy's Technical Representative's discretion. No imported materials shall be delivered to the site until the proposed source and material tests have been tentatively accepted in writing by the Navy's Representative. Final acceptance will be based on tests made on samples of material taken from the completed and compacted course.

c. Gradation tests by the Contractor shall be made on samples taken at the place of production prior to shipment. Samples of the finished product for gradation testing shall be taken in accordance with the Contractor's quality control plan or more often as determined by the Navy's Technical Representative, if variation in gradation is occurring, or if the material appears to depart from the Specifications. The Contractor shall perform any additional tests prescribed by the Navy's Technical Representative. Test results shall be forwarded to the Navy's Technical Representative within 48 hours after sampling.

d. If test conducted by the Contractor or the Navy's Technical Representative indicate that the material does not meet Specification requirements, material placement will be terminated until corrective measures are taken. Material which does not conform to the Specification requirements and is placed in the work shall be removed and replaced at no expense to the Government.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

3.1.1 Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, and brush within the clearing limits. Remove stumps entirely.

3.1.2 Unsuitable Material

Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath gravel roadway area.

3.2 PROTECTION

3.2.1 Underground Obstructions

Location of the existing obstructions indicated is approximate. The Contractor shall physically verify the location and elevation of the existing obstructions indicated prior to starting construction.

3.2.2 Site Drainage

Provide for the collection, treatment and surface discharge of surface and subsurface water encountered during construction.

3.2.2.1 Surface Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. Provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein.

3.2.2.2 Subsurface Drainage

Base on site surface and subsurface conditions, available soil, and hydrological data. Remove water by pumping or other methods to prevent softening of surfaces exposed by excavation. Provide water treatment as indicated on approved shop drawings. Operate dewatering system continuously until construction work below existing water levels is complete. After placement of initial backfill, water level may be allowed to rise, but never above one foot below the prevailing level of excavation or backfill. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system.

3.2.2.3 Collection, Treatment and Discharge of Contaminated Water

This item shall include all work specified in this paragraph for collecting, treating and discharging of contaminated surface and subsurface water in excavations at the site, and investigation derived wastes (IDW) liquids. The Contractor shall furnish all labor, materials, and equipment necessary to accomplish work specified in this paragraph.

a. Collection of Contaminated Water:

1. The Contractor shall, to the extent possible, conduct his excavation and backfilling operations at the site in a manner that minimizes the amount of surface and subsurface water which may collect in the open excavation.

2. If standing surface or subsurface water is present in the excavation, the Contractor shall remove and containerize such water in containers or tanks approved by DOT for containment and transportation of contaminated water.

3. The Contractor shall collect all IDW liquids located at the site as indicated on the plans.

b. Storage of contaminated water shall be in containers or tankers approved by DOT for containment and storage of contaminated water.

3.2.2.4 On-Site Treatment and Disposal

a. The treatment system shall be capable of removing contaminants to the following limits:

Contaminant	Discharge Limit (mg/L)
BTEX	1.0
Arsenic	0.1
Lead	1.0
Chromium	2.0
Barium	2.0
Cadmium	0.1
Zinc	2.0
Acetone	1.0
Total Toxic Organics	2.13 (with no single organic exceeding 1.0 mg/l per 40 CFR 433.11(e))

b. The Contractor shall be responsible for all aspects of verifying design parameters, designing, providing, installing, operating, maintaining, and removing collection, storage, and treatment facilities required.

c. The Contractor shall monitor, test, and adjust the treatment system in accordance with the frequency specified in the operations and maintenance instructions for the system, or as otherwise modified by special regulatory requirements or an approved Sampling and Analysis Plan. If there is a conflict between requirements, the more stringent requirement shall prevail.

d. Water treated to the required treatment standards shall be discharged to the sanitary sewer which is near the site.

e. Upon completion of work, the surface water and groundwater treatment system shall be closed and removed from the site and the treatment site shall be restored to its original condition. All equipment shall be decontaminated in accordance with the Contractor's Site Health and Safety Plan.

f. All carbon, residues, cleaning aids, decontamination liquids, and contractor generated waste, shall be containerized in accordance with applicable regulations and shall be transported to permitted RCRA treatment disposal facilities authorized to accept such wastes, in accordance with Section 02223, "Transportation and Disposal of Contaminated Material."

3.2.2.5 Sampling and Analysis

Sampling of influent and effluent shall be conducted in accordance with appropriate procedures contained in 40 CR Part 136. If no appropriate procedure is contained therein, a standard procedure approved by EPA shall be used to measure constituent concentrations.

Conduct sampling in accordance with an approved Sampling and Analysis Plan.

Sampling and analysis shall include at a minimum, the following materials, locations, frequencies and analytical methods.

a. Effluent from the on-site treatment system's holding tank once prior to initial discharge to confirm removal of contaminants to discharge limits specified previously, then twice per day - EPA Methods 8010, 8020, 7060, 7131, 7191, 7421, and 7950.

3.2.3 Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.3 EXCAVATION OF CONTAMINATED MATERIALS

3.3.1 Materials and Equipment

3.3.1.1 General

The Contractor shall provide all labor, materials, and equipment necessary to accomplish the work specified in this paragraph.

3.3.1.2 Unclassified Excavation

Excavation is unclassified. All excavation shall be completed regardless of the type, nature, or condition of the materials encountered.

3.3.2 General Excavation

All excavation of every description, regardless of the type, nature, or condition of material encountered, shall be performed as specified, shown, or required to accomplish the work.

3.3.3 Location of Excavation

The Contractor shall provide test pits where indicated on the drawings to visually determine the location of disposal trenches for excavation.

3.3.4 Limits of Excavation

a. Once the Contractor has excavated to the preliminary areas and depths shown on the Drawings or located by test pits, and in an approved Work Plan, excavation will stop and the Contractor shall conduct an on-site analysis of the excavation consisting of a visual inspection coupled with field screening equipment to assess organic vapors.

b. Continued Excavation: If visual inspection reveals visibly stained soils or exposed debris, or if the level of organic vapors exceeds 50 ppm, the Contractor shall consult the Navy's Technical Representative to determine an additional amount of soil to be

excavated in accordance with an approved Work Plan. Subsequent excavation and on-site analysis shall follow.

c. When on-site analyses results from soil sampling indicate no visibly stained soil or exposed debris, and organic vapor levels below 50 ppm, samples will be collected and sent to an offsite laboratory for confirmatory analysis. A 48-hour turnaround time for the results of these analyses is required. After confirmatory analysis determines the clean up levels have been met, excavation shall stop.

d. Backfilling of excavated areas will begin only after the results of confirmatory sample analyses are received from the offsite laboratory that indicate contaminant levels below those listed previously. The Contractor will not begin placing backfill in excavated areas without the approval of the Navy's Technical Representative.

e. The Contractor and the Navy's Technical Representative shall work together closely to coordinate excavation, sampling, and analyses to minimize downtime. The Contractor shall schedule work to minimize downtime.

3.3.5 Sampling and Analysis

The Contractor shall conduct sampling and analysis in accordance with an approved Sampling and Analysis Plan. Confirmation sampling shall be conducted in accordance with 40 CFR 261. A minimum of one confirmation soil sample every 50 linear feet at the midheight of each excavation wall and every 600 square feet at the base of the excavation shall be collected and analyzed in accordance with EPA Methods 8010, and 8080.

3.3.6 Loading of Excavated Materials

Contaminated materials shall be loaded into covered containers or vehicles designed to transport such materials without spillage. Care shall be taken during loading operations to minimize the potential for spillage, tracking, or other means of deposition of contaminated materials outside the work area. Contaminated materials which become spilled on roads, streets, or other areas outside the limits of excavation during the loading operation shall be cleaned up immediately to the satisfaction of the Navy's Technical Representative.

3.3.7 Control of Dust

Dust control measures shall be in accordance with Part 4, paragraph 4.12 of the Basic Contract. Keep dust down at all times, including during nonworking periods. sprinkle or treat the soil at the site, haul roads, and other areas disturbed by operations with dust suppressants such as water. Dry brooming will not be permitted.

3.3.8 Method of Measurement

a. The quantity of work done under this paragraph will be measured in tons of "Excavation" which shall be the actual weight of the soil

removed as verified by the weigh scale ticket issued prior to shipping.

b. No separate measurements will be made for control of water, protection of obstructions, or other work associated with the excavation and loading of contaminated materials at the site. These tasks are considered to be incidental to and part of the work specified.

3.4 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

3.4.1 Common Fill Placement

Provide for general site. Place in 12-inch lifts. Compact areas not accessible to rollers or compactors with mechanical hand tampers. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

3.4.2 Backfill and Fill Material Placement

Provide for contaminated soil removal area. Place in 12-inch lifts.

3.4.3 Method of Measurement

a. The quantity of work done under this paragraph will be measured in cubic yards of "Replacement of Soil and Site Restoration" which shall consist of the volume of backfill actually placed back into excavations at the site as specified herein.

b. No separate measurement will be made for grading or finishing the site. These tasks are considered to be incidental to and part of the work specified for "Replacement of Soil and Site Restoration."

3.5 COMPACTION

Expressed as a percentage of maximum density. Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required. Density requirements specified herein are for cohesionless materials. When cohesive materials are encountered or used, density requirements may be reduced by 5 percent.

3.5.1 General Site

Compact underneath areas designated for vegetation to 85 percent of ASTM D 698.

3.6 FINISH OPERATIONS

3.6.1 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.6.2 Seed

Scarify existing subgrade. Provide 4 inches of topsoil for newly graded finish earth surfaces and areas disturbed by the Contractor. If there is insufficient on-site topsoil meeting specified requirements for topsoil, provide topsoil required in excess of that available. Seed shall match existing vegetation. Provide seed at 5 pounds per 1000 square feet. Provide FS O-F-241, Type I, Class 2, 10-10-10 analysis fertilizer at 25 pounds per 1000 square feet. Provide commercial agricultural limestone of 94-80-14 analysis at 70 pounds per 1000 square feet. Provide mulch and water to establish an acceptable stand of grass.

3.6.3 Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.7 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property surplus or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber.

-- End of Section --

SECTION 02223

TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

CODE OF FEDERAL REGULATIONS

40 CFR Parts 260 to 280
40 CFR Part 761
49 CFR Parts 100 to 180

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

SW-846 (1986) Test Methods for Evaluating Solid Waste (Physical/Chemical Methods)

1.2 SUBMITTALS

Submit the following:

1.2.1 SD-08, Statements

The Contractor shall provide the Navy's Representative with the following decontamination, transportation and disposal documentation:

a. Verification that the proposed disposal site is permitted to accept the contaminated materials specified, prior to the start of excavation.

b. Copies of manifests and other documentation required for shipment of waste materials within 24 hours after removal of waste from the site.

c. Verification that the wastes were actually delivered and disposed of at the proposal site, within 7 days of disposal.

d. Verification that all vehicles and containers were decontaminated prior to leaving the disposal site, within 7 days of disposal.

e. Verification that all vehicles and containers were decontaminated prior to leaving the work site, were properly operating, and were covered, within 24 hours after removal of waste from the site.

1.3 DEFINITIONS

The following definitions shall apply, in addition to the definitions for the various waste types described in Part 4 of the Basic Contract.

1.3.1 Government Generated Waste

Government generated waste shall include all contaminated materials existing at the site prior to the commencement of contract work.

1.3.2 Contractor Generated Waste

Contractor generated waste shall include all materials which become contaminated with wastes as defined in the Basic Contract as a result of Contractor activity at the site after the commencement of contract work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Materials and Equipment

The Contractor shall furnish all labor, materials, and equipment necessary to transport and dispose of contaminated soils in accordance with applicable federal, state, and local requirements.

3.1.2 Records

The Contractor shall originate, use, and maintain the waste shipment records/manifests required by the Resource Conservation and Recovery Act (RCRA) and the U.S. Department of Transportation.

3.1.3 Temporary Storage of Contaminated Materials

The Contractor shall schedule and control the work such as to minimize the quantity and duration of on-site contaminated material storage. All contaminated materials stored on-site shall be stored in covered containers or vehicles designed to contain such materials without spillage. Any damage or contamination caused by contaminated materials storage shall be repaired or removed to the satisfaction of the Navy's Representative.

3.1.4 Use of Weigh Scales

Weigh scales located at the Salvage Yard next to the site will be available at no charge for the Contractor's use during normal working hours. The Contractor will receive an unofficial weigh ticket from the scale operator. The Contractor must coordinate use of the scales directly with the Defense Reutilization and Marketing Office (DRMO) that runs the Salvage Yard. (The phone number is 804-444-5600.) The Contractor must coordinate the access and egress route for the use of the scale.

3.1.5 Transportation

The Contractor shall be solely responsible for complying with all federal, state, and local requirements for transporting hazardous materials through the applicable jurisdictions and shall bear all responsibility and cost for

any noncompliance. In addition to those requirements, the Contractor shall do the following:

a. Inspect and document all vehicles and containers for proper operation and covering.

b. Inspect all vehicles and containers for proper markings, manifest documents, and other requirements for waste shipment.

c. Perform and document decontamination procedures prior to leaving the worksite and again before leaving the disposal site.

3.1.6 Disposal

All contaminated materials removed from the site shall be disposed of in a RCRA hazardous waste treatment/disposal facility permitted to accept such materials.

3.1.7 Sampling and Analysis Requirements for Disposal

The Contractor shall conduct sampling and analysis in accordance with an approved Sampling and Analysis Plan. The Sampling and Analysis Plan shall provide a proposed plan for sampling and analyses in the event that drums or potentially off-spec soil is encountered.

3.1.8 Method of Measurement

The quantity of work done under this Section will be measured in tons of soil for "Transportation and Disposal" as determined in accordance with paragraph titled "Method of Measurement" of Section 02220.

-- End of Section --

SECTION 02610

GRAVEL PAVING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO-T96	1983 Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

ASTM D 2922	1991 Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT)

VDOT-RBS	Jan. 1991 Road and Bridge Specifications

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS

ASTM D 698	1978 Moisture-Density Relations of Soils and Aggregate Mixtures Using 5-lb (4.54 kg) and 12-inch (457 mm) Drop

1.2 MATERIAL TESTS AND TEST REPORTS

The testing requirements for materials incorporated in referenced documents will be waived provided the manufacturer submits certificates stating that previously manufactured materials have been tested by recognized laboratories, that such materials meet testing requirements specified, and that the materials furnished for this project are of the same type, quality, manufacture and make as that tested. Copies of the test reports need not be submitted except as specifically requested by the Navy Tecnical Representative.

1.3 SUBMITTALS

1.3.1 SD-13, Certificates

Submit certificates from the manufacturer attesting that the following products conform to all requirements of this specification and of reference documents:

a. Stone Base Course

1.4 REQUIREMENTS

The work includes construction of gravel paving surface course. Preparation of the subgrade shall be as specified under the section of this specification entitled "General Excavation, Filling and Backfilling". Except as specified herein or indicated on the drawings, all work and materials shall be in accordance with the VDOT "Road and Bridge Specifications". The provisions therein for method of measurement and payment do not apply.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Stone Base Course

Materials shall be in accordance with the VDOT "Road and Bridge Specifications", Sections 203 Size 19, 20, 21, 21a, or 22.

PART 3 EXECUTION

3.1 GRAVEL PAVING COURSE

Spreading of the gravel material shall begin at the point nearest the source of supply. Hauling shall be done and traffic permitted over the gravel to assist in compaction. Any ruts formed by the traffic shall be carefully filled and re-rolled. After the gravel course is in place, machining and rolling shall continue until the surface is smooth, hard, and well bonded. Compaction of 95 percent of maximum density, as determined by ASTM D 698, Method D, shall be obtained in the gravel course. Gravel thickness after compaction shall be 6 inches minimum. The gravel shall be machined as often as necessary to maintain it smooth and true to grade.

3.2 TESTS

The following minimum number of tests shall be performed to ensure compliance with the thickness and compaction requirements for gravel paving course:

a. Thickness of gravel paving course - One confirmatory measurement using a conventional measuring tape for each 500 square yards or fraction thereof.

b. Density of gravel paving course - One field test using ASTM Method D 2922 for each 1000 square yards or fraction of each lift.

-- End of Section --

SECTION 02735

MONITORING WELL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS:

C 494-92	Chemical Admixtures for Concrete
D 1785-91	Polyvinylchloride (PVC) Plastic Pipe Schedules 40,80, and 120

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) PUBLICATION:

570/9-75-001	Manual of Water Well Construction Practices

1.2 SUBMITTALS

Submit the following:

1.2.1 SD-02 Manufacturers Data

a. Bentonite seal

1.2.2 SD-04 Drawings

Shop drawings or catalog cuts showing well components and details of well casings, well screens, and well manhole assembly. Shop drawings or catalog cuts shall be accompanied by a cross section showing the relative size, location, and spacing of the well components such as the hole size, well casing, well screen, gravel filter, and grout.

1.2.3 SD-13 Certificates of Compliance

a. Casings
b. Screens
c. Gravel

1.2.4 SD-18 Records

Submit all well logs in boring log format indicating water table, change in formations, etc.

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact. Replace defective or damaged materials with new materials.

1.4 DESCRIPTION OF WORK

The work includes providing two 15 feet deep monitoring wells and one 60 feet deep monitoring well for future sampling and testing and incidental related work. Provide the well complete and ready for operation. Locate new wells as close to original well location after all construction is complete. The well, including equipment, materials, installation, and performance shall be in accordance with the EPA Manual of Water Well Construction Practices, except as modified herein. In the manual referred to herein, the advisory provisions shall be considered mandatory, as though the word "shall"has been substituted for the word "should" wherever it appears. Reference to the "Project Representative" and the "Owner" shall be interpreted to mean the Contracting Officer. Other applicable requirements are included under Section 01560, "Environmental Protection".

1.5 MONITORING WELL

Provide in accordance with the detail as indicated.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the respective specifications and other requirements as specified herein.

2.1.1 Monitoring Well Casings

Provide casings that conform to ASTM D 1785, that are threaded, Schedule 80, polyvinylchloride (PVC) 1120 or PVC 1220 with a nominal two inch diameter. Provide Teflon tape for jointing the threaded pipe.

2.1.2 Monitoring Well Screens

Provide monitoring well screens that conform to ASTM D 1785, that are threaded, Schedule 80 PVC with a two inch inside diameter. Provide screens with adequate strength to resist external forces, both during and after installation. The length and the slot opening size of the well screens shall be as indicated on the detail drawings.

2.1.3 Sand Pack

Provide clean sand of the proper size and gradation to allow free flow of water in the well and prevent the infiltration of surrounding soils.

2.1.4 Bentonite Seal

Provide highly plastic colloidal clay consisting of approximately 90 percent montmorillonite.

2.1.5 Well Cap Assembly

The well cap assembly shall consist of a water tight flush-mounted manhole cover. The inner 2-inch diameter PVC casing shall be capped with a water

tight lockable cap. The assembly shall be provided with a padlock and a minimum of two keys.

PART 3 EXECUTION

3.1 DRILLED HOLES

Drill holes as close to the original well locations as shown on the site plans. Holes shall be of a sufficient size to install the monitoring wells, but not less than 6 inches in diameter. The locations, sizes of the wells, and the method of drilling must be approved prior to work being started. The drilled hole shall not be less than 15'-6" deep for wells GW-4 and GW-5 and 60'-6" for Well B-MW5B. Keep an accurate log and record of the material drilled and note the depths at which changes in formation occur. Do not install the monitoring well until the drilled hole has been approved by the Contracting Officer.

3.2 WELL INSTALLATION

3.2.1 Well Casing and Well Screen

Install the well casing concentrically in the drilled hole and extend the casing down to a minimum depth as indicated. Seal the bottom of the screen with a threaded plug, consisting of the same material and thickness as the screen body.

3.2.2 Sand Packing

Prior to placing the bentonite seal, fill the entire annular space between the screen and the outside wall of the hole with sand. Extend the sand packing from the bottom of the drilled hole to the bottom of the bentonite seal as indicated on the detail drawing. Place the sand with a tremie pipe in accordance with Articles 54 and 50 of the EPA Manual of Water Well Construction Practices. Control speed of sand placement to prevent bridging and to allow for settlement of the sand. Equipment and methods required to place the sand shall be approved by the Contracting Officer prior to commencement of work. Fill the void between the casing and the drilled hole with bentonite to seal the casing to the wall of the drilled hole as indicated. Place bentonite from the bottom upward to effectively seal the annular void.

3.2.3 Sanitary Seal

Provide a sanitary seal for the well casing to prevent contamination.

3.2.4 Waste Disposal

Dispose of soil removed from the drilled holes by deposition at the construction site. Handle soil removed from the drilled holes as contaminated soil. Store, sample, test and dispose of soil as indicated in Section 02220, "Excavation, Filling and Backfilling."

3.2.5 Well Cap

Provide a well cap in accordance with the design drawings and these specifications.

--End of Section--

SECTION 02950

WETLANDS AREA SHRUBS, PLANTS, AND GRASS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z60.1	1986 Nursery Stock
ANSI Z88.2	1980 Practices for Respiratory Protection
ANSI Z133.1	1988 Tree Care Operations - Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush - Safety Requirements

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 580	1983 Stainless and Heat-Resisting Steel Wire
ASTM C 4	1962 (R 1986) Clay Drain Tile
ASTM C 136	1984 (Rev. A) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 498	1965 (R 1986) Perforated Clay Drain Tile
ASTM C 700	1989 (Rev. A) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM D 1861	1988 Homogeneous Bituminized Fiber Drain and Sewer Pipe
ASTM D 1862	1988 Laminated-Wall Bituminized Fiber Drain and Sewer Pipe
ASTM D 2103	1986 Polyethylene Film and Sheeting
ASTM D 2178	1989 Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM D 2417	1988 Perforated, Laminated-Wall Bituminized Fiber Pipe for General Drainage
ASTM D 2729	1989 Poly(Vinyl Chloride) (PVC) Sewer

Pipe and Fittings

ASTM F 405	1989 Corrugated Polyethylene (PE) Tubing and Fittings

AMERICAN WOOD PRESERVERS ASSOCIATION (AWPA)

AWPA C2	1990 Lumber, Timbers, Bridge Ties and Mine Ties, Pressure Treatment

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1000-SUBPART Z	Toxic and Hazardous Substances

FEDERAL SPECIFICATIONS (FS)

FS A-P-166(Rev. E)	Peat, Moss; Peat Humus; and Reed-Sedge
FS O-F-241(Rev. D)	Fertilizer, Mixed, Commercial

L.H. BAILEY HORTORIUM (HORTUS)

HORTUS	1976 Hortus Third

STATE OF CALIFORNIA DEPARTMENT OF AGRICULTURE

RFNI	Regulations for Nursery Inspections

DEPARTMENT OF AGRICULTURE (DOA)

DOA SSIR	April 1984 Soil Survey Investigation Report No. 1, Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples, Soil Conservation Service

UNIVERSITY OF CALIFORNIA DIVISION OF AGRICULTURE AND NATURAL RESOURCES (UCDANR)

UCDANR 4091	1979 Annotated Checklist of Woody Ornamental Plants of California, Oregon, and Washington

1.2 DEFINITIONS

1.2.1 Pesticide

Pesticide means soil fumigants, herbicides, insecticides, and fungicides.

1.2.2 Wetlands Restoration Area

Refers to all disturbed areas along the pond and drainage ditch as indicated.

1.3 SUBMITTALS
Submit the following:

1.3.1 SD-13, Nursery certifications

Indicate names of plants in accordance with the HORTUS, including type, quality, and size. Include a one year guarantee as indicated in Paragraph 1.6 of this specification.

1.3.2 SD-02, Pesticide and Fertilizer Product Data

Indicate the types of pesticides and fertilizers proposed for application to the site. Include manufacturer's information and brochures on proposed products.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Branched Plant Delivery

Deliver with branches tied and exposed branches covered with material which allows air circulation. Prevent damage to root balls and desiccation of leaves.

1.4.1.2 Fertilizer and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, or trademark, and indication of conformance to state and federal laws. Fertilizer and Lime may be furnished in bulk with a certificate indicating the above information.

1.4.1.3 Plant Labels

Deliver plants with durable waterproof labels in weather-resistant ink. Provide labels stating the correct plant name and size as specified in the list of required plants. Attach to plants, bundles, and containers of plants. Groups of plants may be labeled by tagging one plant. Labels shall be legible for a minimum of 60 days after delivery to the planting site.

1.4.1.4 Pesticide Delivery

Deliver to the site in original unopened containers with legible label indicating Environmental Protection Agency (EPA) registration number and manufacturer's registered uses.

1.4.2 Storage

1.4.2.1 Plant Storage and Protection

Store and protect plants not planted on the day of arrival at the site as follows:

a. Shade and protect plants in outside storage areas from the wind and direct sunlight until planted.

b. Heel-in bare root plants.

c. Protect balled and burlapped plants from freezing or drying out by covering the balls or roots with moist burlap, sawdust, wood chips, shredded bark, peat moss, or other approved material. Provide covering which allows air circulation.

d. Keep plants in a moist condition until planted by watering with a fine mist spray.

1.4.2.2 Lime, Fertilizer, and Mulch Storage

Store in dry locations away from contaminants.

1.4.2.3 Pesticides and Antidesiccants Storage

Do not store with other landscape materials.

1.4.3 Handling

Do not drop or dump plants from vehicles. Avoid damaging plants being moved from nursery or storage area to planting site. Handle balled and burlapped plants carefully to avoid cracking or breaking the earth ball. Do not handle plants by the trunk or stem. Puddle bare-root plants after removal from the heeling-in bed to protect roots from drying out. Remove damaged plants from the site.

1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.5.1 Planting Dates

Emergent (herbaceous): April 15 - June 1
Tree and shrub species: February 1 - March 31

1.5.2 Restrictions

Do not plant when ground is frozen or snow covered.

1.6 GUARANTEE

All plants shall be guaranteed for one year beginning on the dates of inspection by the Navy's Technical Representative to commence the plant establishment period.

PART 2 PRODUCTS

2.1 PLANTS

2.1.1 Varieties

Botanical names indicated are listed in HORTUS. Furnish nursery stock in accordance with ANSI Z60.1, except as otherwise specified or indicated.

Each plant or group of planting shall have a "key" number indicated on the nursery certifications of the plant schedule. Furnish plant grown under climatic and soil conditions similar to those in the locality of the project. Spray plants budding into leaf or having soft growth with an antidesiccant before digging. Plants of the same specified size shall be of uniform size and character of growth.

2.1.2 Plant Regulations

ANSI Z60.1, and the following additional requirements.

2.1.3 Shape and Condition

Well-branched, well-formed, sound, vigorous, healthy planting stock free from disease, sunscald, windburn, abrasion, and harmful insects or insect eggs and having a healthy, normal, and unbroken root system.

2.1.4 Plants and Shrubs Used in the Reestablishment Area

2.1.4.1 Shining Sumac (Rhus copallina)

2.1.4.2 Sweet Gum (Liquidamber styraciflua)

2.1.4.3 Groundsel Tree (Baccharis halimifolia)

2.1.4.4 Soft Rush (Juncus effusus)

2.1.4.5 Wool Grass (Scirpus cyperinus)

2.1.5 Size

Minimum sizes shall be those available from the nursery stock, based on the average width or height of the plant for the species as specified in ANSI Z60.1.

2.1.6 Balled and Burlapped (B&B) and Balled and Potted (B&P) Plants

Ball sizes and ratios shall conform to ANSI Z60.1. Ball plants with firm, natural balls of soil. Wrap B&B plants firmly with burlap or strong cloth, and tie securely.

2.1.7 Balled and Platformed (BP) Plants

Wrap and ball in the same manner as B&B plants and fasten securely to strong platforms.

2.1.8 Bare-Root Plants

Dig with root system substantially intact but with the earth carefully removed. Cover roots with a thick coating of mud by puddling after plants are dug or wrap with moist material immediately after digging.

2.1.9 Container Grown Plants

Root growth shall be sufficient to hold earth intact when removed from containers. Root bound plants will not be accepted.

2.1.10 Collected Plants

From native stands or established plantings, with good fibrous root development and vigorous growing condition. Minimum root spread for collected plant materials obtained bare-root shall be one-third greater than minimum root spread of bare-root nursery-grown stock; minimum ball sizes for collected plant materials obtained balled and burlapped shall be the next larger ball size than for nursery-grown stock in accordance with the ANSI Z60.1.

2.1.11 Plantation-Grown Stock

ANSI Z60.1.

2.2 TOPSOIL

2.2.1 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Furnish additional topsoil.

2.2.2 Composition

Use of a slow release fertilizer to enhance the soil conditions during initial growth phases. The fertilizer (approximately 1 ounce per hole) should be placed in the furrow before the plant is transplanted and the roots covered.

If soil from the existing marsh area is not utilized, provide topsoil containing 5 to 20 percent organic matter, 25 to 50 percent silt, 10 to 50 percent clay and 20 to 35 percent sand, with maximum particle size of 3/4 inch.

2.3 PESTICIDES AND FERTILIZERS

All pesticides and fertilizers proposed to be used must be approved by the Navy's Technical Representative prior to application.

2.4 WATER

Suitable quality for irrigation.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Grading and Layout

Stake out approved plant material locations and bed outlines on the project site before digging plant pits or beds. The Navy's Technical Representative reserves the right to adjust plant material locations to meet field conditions.

3.1.2 Transportation

The contractor shall be responsible for providing adequate protection, packaging and handling of all plant materials during their transportation to the site to guard against injury or desiccation. All plants injured and plants with root balls broken during planting operation will be rejected. All plant material is to be planted as soon as possible after its arrival on the site. All bare-root plants ("BR") shall be planted or heeled-in immediately upon delivery to the site. All other plant material that can not be planted immediately upon delivery shall be covered with moist soil, mulch, or other material to provide protection from drying winds and sun. All plants shall be watered as necessary until planted.

3.1.3 Excavation, Topsoiling and Planting

Provide a minimum of 4 inches of topsoil over the entire wetland area. Protect existing adjacent turf before excavations are made. Measure depth of pits from finished grade. Depth of excavation shall provide proper relation between top of ball and finished grade as specified in paragraph entitled "Handling."

3.2 PLANTING

When planting dormant herbaceous wetland plant materials, the growing tip of each individual rhizome, tuber, or bulb shall be planted so that the next year's stem/shoot apical meristem is in an upright position and planted at a minimum depth of three (3) inches and a maximum depth of four (4) inches below the soil surface. The planting of wetland plant material shall not be permitted when the ground is frozen.

When planting non-dormant herbaceous wetland plant materials, each plant shall be planted so that the next year's stem/shoot apical meristem is in a upright position. The plants shall be planted so that the rhizome, tuber, or bulb portion of the plant lies below the surface of the soil. firm foot or hand pressure shall be applied adjacent to the plant to insure good soil and plant contact.

If peat-potted stock is utilized, the same planting procedures shall apply as for the individual dormant and nondormant rhizomes, tubers or bulbs except the peat pot's shall be placed at a minimum depth of one (1) inch and a maximum depth of two (2) inches below the soil surface. The peat potted stock shall support a minimum of one rigorous stem per pot.

The contractor shall furnish, at his or her expense, all necessary hoses,

equipment attachments and accessories for the adequate irrigation of planted areas as required to ensure an adequate supply of water.

All grasses (i.e., Soft Rush and Wool Grass) shall be planted on 18 inch centers. The trees and shrubs (i.e., Shining Sumac, Red Mulberry, Sweet Gum and Groundsel) shall be planted at eight (8) foot centers, alternating, at the top of the slope of the wetland area around the edge of the regraded strip of land. All plants shall be placed upright and faced to provide the best appearance or relationship to adjacent plants. Root shall be spread in their normal position. All broken or frayed roots shall be cut off cleanly. Shrubs, trees and herbaceous materials shall be planted at the same depths they were maintained in the nursery.

Each plant and the entire seeded area shall be thoroughly saturated with water. Care should be exercised when watering to avoid flooding of plants and seeds, and erosion of soil. Avoid the use of high pressure hoses.

Newly graded areas outside the limits of the reestablished wetlands area shall be topsoiled and seeded in accordance with Section 02220 "GENERAL EXCAVATION, FILLING, AND BACKFILLING."

3.3 MAINTENANCE PERIOD

Maintenance shall begin immediately after planting and shall be provided for either the new shrubs and grasses. New planting and seeded areas shall be protected and maintained for a period of ten (10) weeks after formal acceptance by the Navy's Technical Representative/ROICC. Maintenance shall consist of watering activities and other necessary operations adequate to insure the survival of the planted materials and seeded areas for the duration of the maintenance period.

-- End of Section --